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Cover illustration by De Potter

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COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

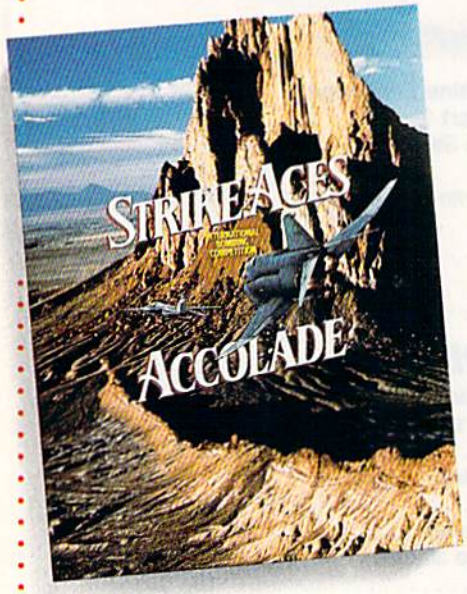
Edited by Mickey McLean

Box Office Hits

Box Office Software, a division of Keypunch (1221 Pioneer Building, St. Paul, Minnesota 55101), has released two new titles based on famous Americans.

In *Buffalo Bill's Rodeo Games* ($29.99), you can prove that you could have held your own in the Wild West. Test your shooting ability, wrestle steers, and become a western hero by rescuing a stagecoach.

Pop star becomes crime fighter in *Michael Jackson's Moonwalker* ($34.99). Make smooth dance moves as you outmaneuver and fight the henchmen of Mr. Big, who has kidnapped the children of the world.



Strike While the Planes Are Hot

Accolade (550 South Winchester Boulevard, Suite 200, San Jose, California 95128) gives you the opportunity to climb into the cockpit of one of six different aircraft and attempt to become an elite fighter pilot in *Strike Aces: International Bombing Competition* ($39.95).

Choose from the McDonnell Douglas F-15E, the MD F-4E, the General Dynamics F-111F, the British Panavia Tornado IDS, the Swedish Saab AJ37, and the Russian MiG-27 Flogger-D. These six can be flown against seven other computer-piloted enemy fighters on 16 different combat-intensive missions. You can also design your own missions.

3-D Racing

Instead of racing around a flat course, try your hand at the three-dimensional speedways found on *Stunt Track Racer* ($29.95) from Medalist International (180 Lakefront Drive, Hunt Valley, Maryland 21030).

Choose from eight tracks that rise hundreds of feet in the air with obstacles such as drawbridges and gaps in the road but without guardrails or other safety features. Each track calls for different racing styles and offers varying challenges. The High Jump track requires you to jump over a chasm hundreds of feet wide and clear a monolith resting in the center.

Although the cars are designed to be tough, they still can suffer damage. Therefore, drivers need to exercise caution to keep their car in condition to finish the race.

In the one-player mode, you begin in the lowest of four stunt track divisions. To advance, you must accumulate the most points by the end of a round-robin tournament against computer-controlled drivers on each of the divisions' tracks. Should you successfully complete all four divisions, you qualify for the Super League, which provides four more challenging divisions, featuring cars with improved engines and better braking power.

The multiplayer mode, for two or more racers, pits each participant, one at a time, against the same series of computerized opponents on the same track. The player who records the most points wins. A practice mode allows you to try out the track before you enter the competition.

Hushed conversation ripples through the crowd as each mutant confers with his neighbor about the news. After a moment, Hinukk Ressok raises his hands once again, and the villagers gradually turn their attention back to him.

Radioactive Adventure

Nuclear holocaust has ravaged the earth and you're one of the survivors in *Bad Blood* ($49.95) from Origin (110 Wild Basin Road, Suite 330, Austin, Texas 78746). You must struggle to exist on the barren land along with other survivors—some human, some mutants.

The three-dimensional game world is displayed in full-color and offers both role-playing and arcade action. You'll explore ruined cities, interact with genetic mutants, and deal with brutal and oppressive leaders.

Bad Blood was designed by Chris Roberts, the author of Origin's *Times of Lore.*

Spanish Translator

Commodore 128 owners now have the ability to translate Spanish words to English with *Spanada 128* ($59.95) from Spanada Enterprises (1 Sands Ranch Road, Huachuca, Arizona 85616). The program has the ability to distinguish between words that have more than one meaning.

Using the program, you can translate words, lists of words, or sentences from Spanish to English. Over 25,000 words, including their conjugations and variations, are stored on disk. Word searches take from 1½ to 6¼ seconds or are instant if the word is stored in RAM. To translate a complete sentence, first enter it in Spanish. After the program translates each word, including all possible multiple meanings, it will offer its interpretation of the entire sentence.

Spanada 128 also has the capability to convert English to Spanish, but only on a word-by-word basis and only if the word can be found in RAM. ▷

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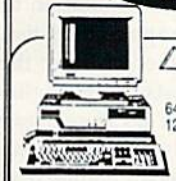

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COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

UBI Has 2-4-U

UBI Soft Entertainment Software has added two new titles to its growing line of products.

Pro Tennis Tour—The Ultimate Tennis Simulation ($29.95) features the four major Grand Slam tournaments: the Australian Open, the French Open, Wimbledon, and the U.S. Open. Before stepping onto center court, you can practice against the computer or another player. Six different practice programs feature three levels of difficulty on either grass, clay, or cement courts. An instant-replay option allows you to show off that great baseline shot again.

Iron Lord ($39.95) takes you back to medieval times where you'll encounter some legendary characters. You must prove your birthright through strategy and strength. As you travel to towns throughout the countryside, you must build a following that will go to war for you. To win over the townsfolk, impress them with your archery, arm-wrestling, swordplay, and dice-throwing skills.

All UBI Soft products are distributed by Electronic Arts (1820 Gateway Drive, San Mateo, California 94404).

Third Box of Gold

Strategic Simulations (675 Almanor Avenue, Sunnyvale, California 94086-2901) has released *Champions of Krynn* ($39.95), the third game in SSI's gold box series, and the first Advanced Dungeons & Dragons fantasy role-playing game set in the Dragonlance game world. It also utilizes the same game system as *Pool of Radiance* and *Curse of the Azure Bonds*, the other two games in the series.

The object of the game is to guide a party of up to eight characters through combat and adventure in an effort to defeat a plot by the forces of evil to establish the Dark Queen, Rakhisis, as undisputed ruler of Krynn. Characters include kenders and Knights of Solamnia as well as most races and classes found in *Pool of Radiance* and *Curse of the Azure Bonds*.

New features include moons with phases that affect a mage's power and gods that grant special abilities to their clerics. New monsters include draconians, dragons, and a death knight.

Gangland Battle

Data East USA (1850 Little Orchard Street, San Jose, California 95125) has introduced *The Untouchables* ($29.95), an action game based on the Brian DePalma movie of the same name.

The game, which follows the plot of the film, takes you back to the days of prohibition for a battle between federal agents and mobsters. Your role is that of federal agent Eliot Ness, who must confront the notorious gangster kingpin Al Capone. You and your band of five law enforcers must fight the mob and restore order to the city of Chicago.

Stop the Flooz Flow

Pipe Dream ($29.95), a spatial strategy game from Lucasfilm Games (P.O. Box 2009, San Rafael, California 94912), requires you to build the longest possible continuous pipeline while trying to stop a stream of chemical fluid called *flooz*.

There are 36 different levels that become increasingly difficult as you move through them. To make life harder, the higher levels feature one-way pipes, tougher obstacles, and faster-flowing flooz.

Beastly Transformer

Sega has announced the release of the Commodore 64 version of the coin-operated arcade game, *Altered Beasts* ($34.95).

As the beast, you have been summoned from the dead by Zeus, god of thunder. You must challenge the wicked Neff, god of the underworld, and save Athena. You have been bestowed with five formidable forces of transformation, each more ferocious than the previous. Your battles will pit you against treacherous foes such as Grave Masters, Chicken Stingers, and Cave Needles. Two players can compete simultaneously throughout the game's five rounds of action.

Altered Beast, as well as other Sega titles, is distributed by Electronic Arts (1810 Gateway Drive, San Mateo, California 94404).

Bo Knows Computing

Data East USA (1850 Little Orchard Street, San Jose, California 95125) has announced the signing of an exclusive contract with Kansas City Royals outfielder Bo Jackson to help in the development of *Bo Jackson Baseball* ($39.95), an extension of the Data East MVP Sports line.

Bo Jackson Baseball is the first sports simulation to use realtime online sports statistics. By accessing data by modem from the USA TODAY Sports Center online service, you can place Bo in real game situations using daily statistics from major league baseball games played during the 1990 season.

The USA TODAY Sports Center provides access to up-to-the-minute information from *USA TODAY*'s national sports desk. G

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Only NRI walks you through the step-by-step assembly of a powerful AT-compatible computer system you keep—giving you the hands-on experience you need to work with, troubleshoot, and service all of today's most widely used computer systems. You get all it takes to start a money-making career, even a business of your own in computer service.

No doubt about it: The best way to learn to service computers is to actually *build* a state-of-the-art computer from the keyboard on up. As you put the machine together, performing key tests and demonstrations at each stage of assembly, you see for yourself how each part of it works, what can go wrong, and how you can fix it.

Only NRI—the leader in career-building, at-home electronics training for more than 75 years—gives you such practical, real-world computer servicing experience. Indeed, no other training—in school, on the job, *anywhere*— shows you how to troubleshoot and service computers like NRI.

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With NRI's exclusive hands-on training, you actually build and keep the powerful new AT-compatible West Coast 1010 ES computer, complete with 1 meg RAM and 20 meg hard disk drive.

You start by assembling and testing the 101-key "intelligent" keyboard, move on to test the circuitry on the main logic board, install the power supply and 1.2 meg 5¼" floppy disk drive, then interface your high-resolution monitor. But that's not all.

Only NRI gives you a top-rated micro with complete training built into the assembly process

Your NRI hands-on training continues as you install the powerful 20 megabyte hard disk drive—today's most wanted computer peripheral—included in your course to dramatically increase your computer's storage capacity while giving you lightning-quick data access.

Having fully assembled your West Coast 1010 ES, you take it through a complete series of diagnostic tests, mastering professional computer servicing techniques as you take command of the full power of your computer's high-speed 80286 microprocessor.

In no time at all, you have the confidence and the know-how to work with, troubleshoot, and service every computer on the market today. Indeed you have what it takes to step into a full-time, money-making career as an industry technician, even start a computer service business of your own.

No experience needed, NRI builds it in

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EDITOR'S notes

The ballots are in and tabulated on the 1989 *Gazette* Readership Survey. As promised, we'll share the results with you. First, a special thanks to those readers who took the time to fill out the questionnaires and send them in.

We've been running our reader surveys annually for three years. While not scientific, they do provide us with solid information about you, our readers. In fact, they very closely match the results we get from paid reader research. Without further ado, here's the lowdown:

- 40% own 128s.
- 26% own or regularly use a computer other than a 64 or 128.
- Of those who own or use another computer, the favorites are MS-DOS (43%), VIC-20 (28%), Amiga (13%), and Plus/4 (11%).
- 49% do not plan to buy another computer in the next year (15% will buy another machine and 21% are undecided).
- Favorites among readers who plan to purchase a new computer are Amiga (52%), MS-DOS (39%), 128 (25%), and 64 (18%).
- Nearly 56% use GEOS.
- 26% belong to a Commodore user group.
- 20% don't program; of those who do, BASIC is preferred (64%) over machine language (21%).
- The Programming and Departments sections of *Gazette* are the clear favorites.
- *All* of the columns are popular; front runners are "Feedback" (80%), "Letters to the Editor" (79.5%), "Editor's Notes" (74%), "The Programmer's Page" (66%), and "Horizons" (57%).
- 41% use *SpeedScript*.
- 90% use the programs we publish.
- 80% type in our listings.
- The kind of programs readers would like to see more of in future issues: utilities.
- Other magazines that *Gazette* people read regularly: *RUN* (49%), *COMPUTE!* (9%), and *The Transactor, Info,* and *Computer Shopper,* each at 5%.

Since we've run three consecutive annual surveys, it's enlightening to compare results. Answers to some questions have changed only slightly in terms of percentages, while others indicate clear trends. Here's a sampling of results based on comparisons of our surveys from the December issues of 1987, 1988, and 1989.

- Of those who plan to buy another computer in the coming year, the PC has risen in favor, from 19% to 32% to 39% in respective years; the Amiga, likewise, has risen from 33% to 38% to 52%; and the numbers for the 128 (35% to 40% to 25%) reflect the discontinuance of the machine last year.
- GEOS use among readers has grown from 44% to 53% to 55.5%.
- User group membership has stayed steady at around 27% for three years.
- Readers who use our programs have increased in number (84% to 89% to 90%).
- Last, and somewhat surprising, is the change in the number of readers who type in our programs: from 72% to 77% to 80%.

This year's survey was somewhat longer than previous ones, and, frankly, we went out on a limb. We asked you to grade us in six categories: general news and product info, technical info, graphic presentation, quality of programs, quality of writing/editing, and overall grade. We requested that you consider our strengths and weaknesses and grade us on a scale of 1–10 (low to high)—a report card of sorts. The results were a pleasant surprise: an overall grade average of 8.3, with a low of 7.7 for technical info to a high of 8.5 for quality of writing/editing.

Again, thanks for your time and effort. We've learned a lot about how to serve you better in the months ahead.

Lance Elko
Associate Publisher

COMPUTE!'s GAZETTE FOR COMMODORE USERS 64/128

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LETTERS to the editor

Send questions or comments to Letters to the Editor, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We reserve the right to edit letters for clarity and length.*

The Right Data

In the article "The 64—Hot or Cold?" in the February issue, you mentioned that an IBM drive was used to send a program to a 64. Does this mean that the 64 is IBM compatible?

Kevin Odom
Crowley, LA

The 64 is most definitely not IBM compatible. In the February feature, it was the IBM computer, not the drive, that sent the data. What's important to understand here is that, with the right cables and software, any computer can send a batch of data to any other computer (much the way a disk drive sends data to a computer's memory). Of course, the receiving computer must be able to understand and act on the data it has received.

GIF Rift

I was shocked to read in your February column that there is now a GIF viewer for the 128! No, even more, I was ecstatic! And it is located only a phone call away to the CompuServe Graphics Support Forum, too! I was *really* looking forward to trying it out. Only reality got in the way—no one at CompuServe has ever heard of any GIF viewer for the 128. So, back to you. What is the filename of the GIF viewer for the 128? Are you sure that CompuServe has it?

L. E. Petery
Portland, OR

Oops, we were a bit premature. There are two 128 GIF viewers in development which, in fact, might be available by the time you read this. We don't know what the filenames will be, but the viewers will be found on the Graphsupport Forum (type GO PICS) on CompuServe. Incidentally, we received our info from a CompuServe sysop.

Tracking Transactor

I'd like to ask your assistance in tracking down *The Transactor* magazine. I've been told by the Canadian Direct Marketing Association that *The Transactor* has closed up offices and presumably gone out of business. I do know for a fact that the magazine was purchased by Croftward Publishing, but I am unable to locate this company.

Clive Bunning
Kelowna, B.C., Canada

The Transactor, *as we know it, has indeed gone out of business. The address of its parent company is Croftward Limited, Finsbury Business Centre, 40 Bowling Green Lane, London, England EC1R ONE.*

Another Taste

The reader comment in "Bad Taste?" in your March issue is ridiculous. *Gazette* is in the top 1 percent of "good taste!" This reader apparently doesn't see all the junk on the newsstand.

Jack W. Bolinder
Wilkes-Barre, PA

As Long As It's Dry

Just a quick thank-you for switching to newsprint in your magazine. I know it was probably done for cost-saving reasons, but the newsprint is much easier to read as it cuts down on the glare off the page when there's a light overhead. A great win-win situation! Unfortunately, I don't think it will hold up as well as before if I drop it in the tub.

Tom Culler
Ypsilanti, MI

Powered Down

I've been searching for a particular joystick for my 64: the Power Stick by Amiga. I presently have two of them, but they're wearing out. I can't seem to find the Power Stick. Can you help?

Warren Meeker
Cullowhee, NC

During the development of the Amiga computer and well before Commodore purchased the company, the Amiga Corporation produced computer and game-machine peripherals, including the Joyboard (kind of a cross between a joystick and a surfboard) and the Power Stick. Unfortunately, both products have been out of production for at least four years.

Secret POKEs

In your March column, you ran a letter from F. S. A. Johnstone, who requested a simple solution to the "Tape or Disk?" question found in *SpeedScript*. Here's a simple solution. Load but don't run a copy of *SpeedScript*. Then type POKE 4904,162:POKE 4905,8:POKE 4906,76 :POKE 4907,61:POKE 4908,19. Now resave the modified version of *SpeedScript* with a new filename.

Carl E. Snyder
Cavendish, VT

Years ago, we published a series of POKEs that accomplished this, but as the March issue went to press, we were unable to locate them—even with the help of the Gazette Index *disk. As it turns out, we were barking up the wrong tree: The list of POKEs was published in the "Readers' Feedback" column of the January 1986 issue of* COMPUTE! *magazine. The POKEs in that column were intended for versions 3.0 and 3.1. Anyway, your POKEs work fine for the current version, 3.2. Thanks for the tip.*

The Sensible 64

I read Lance Elko's "Editor's Notes" in the February issue, and I share his sentiments completely. Last spring, I purchased a PC XT clone with a 20-megabyte hard drive, a new printer, and a color monitor. Two months later, I traded it for cash and a Commodore 64 system. The 64 is just what I want—it is a *home* computer. The MS-DOS machine was much less friendly, so much so that it seemed like work. Recreational or hobby computing should *not* be work. The software I've accumulated is mentally stimulating and serves my needs and wants very well. Additionally, there are some very good 64 titles at very inexpensive prices. To me, the 64 just makes sense—I don't need a cannon to swat a fly.

Thomas W. Farrell
Philadelphia, PA

SpeedStuff

In May 1987, I purchased your disk containing *SpeedScript*. In your March issue (page 46), you advertise a *SpeedScript* disk. Please tell me the difference.

Joseph H. Zambo
Metairie, LA

The word processor, SpeedScript, *is the same on both disks. On the current* SpeedScript *disk, however, the word processor is bundled with a spelling checker and more than a dozen other* SpeedScript *support utilities, plus documentation on how to use each one of them. The May 1987 disk that you have is apparently our regular monthly disk; the corresponding magazine issue contained the debut of* SpeedScript *version 3.2.* **G**

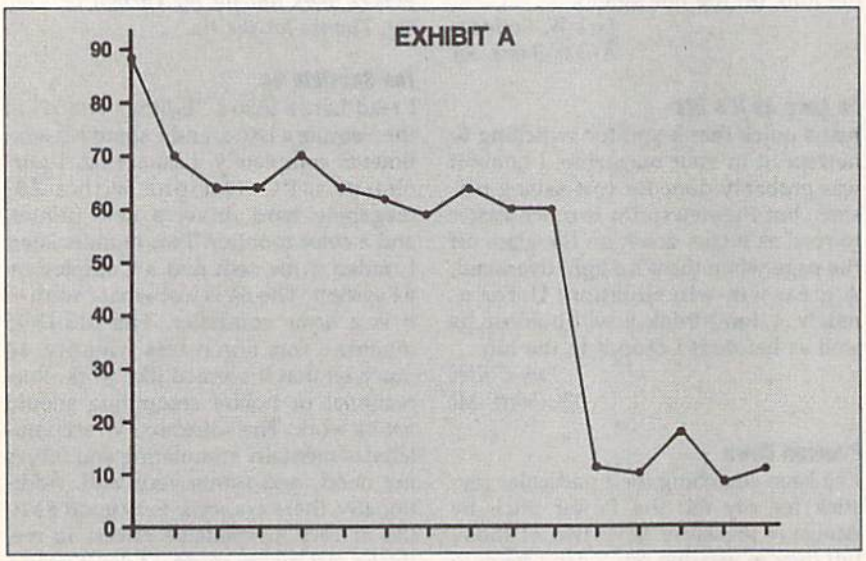
horizons

Off the Shelf

Rhett Anderson

If you've been reading this column, you know that I never have an illustration, picture, or photo on the page. Because of a shocking development, though, I've broken tradition this month to show you a graph. You'll find it in the middle of the page, labeled Exhibit A.

Believe it or not, this is not a graph of the stock market plunge of October 1987. The left axis is labeled in units of pages, the bottom one is in units of time (months, to be precise). Do you know what the graph represents?



It represents the placement of "Horizons" in *Gazette*. In January 1989, the column was hidden away in the attic of the magazine. However, as you can see from the obvious downward, or rather, forward trend, "Horizons" is now in the foyer, just passing the umbrella stand. It will be out the door in a few short months.

In other words, this column is moving closer and closer to the front of the magazine (or the *book*, as we say in the biz.) It will soon be on the cover. Eventually, unless I've missed an asymptote somewhere, it will hover a few inches in front of the magazine, no doubt causing great consternation to the U.S. mail and your local computer magazine retailer.

I bring this issue up so that I can warn you that "Horizons" may be a bit tricky to find next month. I'm attempting to relocate myself onto a full-color (called *four-color* in the biz) page so that I can show you photos of the wonderfully redesigned Commodore 64s that readers sent me. I'll also be announcing the prizes.

The Mailman Gives Me Advice

A few months ago, my wife, Tiffany, and I moved from our two-bedroom apartment into a two-story house. Our cat, Mr. Spock, found the new location much to her liking. Although her favorite spot is the enclosed back porch, she also relishes watching mail drop through the mail slot onto the floor.

The only reason that any mail ever comes through the slot is that our mailbox proper is a disaster. If you put mail in, the box drops off the side of the house. If you pull mail out, the box drops off the side of the house. On days where we have mail coming and going, that's four drops (two each by us and the mailman). Each time the box drops, it chips the ceramic planter on the ground. With my luck, the youngster who sold us Girl Scout cookies will somehow get one of these clay shards lodged far enough into her foot so that she can sue us. The poor lass; the cat about ripped off her left hand when she gave it a hesitant pat on the head.

In an embarrassing turn of fate that would only make sense in a foreign movie, I have the same mailman at home that I have at work. The other day he stopped me in the office just as I was about to get a cup of coffee. "Rhett, I've got a problem with your mailbox."

"You're not the only one," I said, trying to shirk responsibility. "Hey," I said, trying to pull him off guard, "what would you recommend?"

"You gotta get down to the hardware store and get some cement plugs and stick them into the holes. You can't screw woodscrews into the side of a brick house."

"Was the mailbox like that before we moved in?" I asked, passing the responsibility onto the tenants that preceeded me, and, ultimately, I hoped, onto the landlords themselves.

"Yeah, it's always been like that." He left me a letter from Chris Millsap; then later he dropped some junk mail into my planter at home.

Chris Millsap Says

Still feeling guilty about my mailbox, I read the letter from Mr. Millsap. In January, I had stated that you'd probably never see a high-quality ray-tracing program for the 64. Chris says that there are indeed ray-tracing programs for the 64 and that there's even a version of the famous Amiga *Juggler* animation. He claims that it's the best Commodore graphic that he's ever seen, but that the calculations needed to create the frames take four hours. The animation may be impressive, Chris, but I still maintain that the 64 can't create the subtle shading that makes ray-traced images look real.

Chris has also been following Fred D'Ignazio's series about the 64/Nintendo debate. In his letter, Chris includes the specs for the Nintendo. Since there aren't too many books about programming the NES, these specs aren't as well known as those of the 64, so I thought I'd pass them along.

The Nintendo has 64 sprites, four colors per character cell. Screen resolution is 240 × 256. The Nintendo can display 52 colors per screen. Chris says, "The 64 doesn't even come close to that number of sprites without bizarre and eratic raster interrupts. The Commodore does have better resolution in some modes, but most games are played in 160 × 200 mode to take advantage of all 16 colors. So the Nintendo does indeed have better graphics."

That's all for this month. Remember, it's "Horizons" hide-and-seek next month. **G**

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d'iversions

Gateways into Reality

Fred D'Ignazio

This month, we'll continue the discussion of virtual reality we began in last month's column.

Virtual reality is all around us. Anytime we answer the telephone and talk with a person as if he or she were in the room with us, or turn on the TV and see a picture of someone thousands of miles away, or play an adventure game on our computer, we slide from the real world of our senses into a virtual world where the rules are quite different.

Think about what happens when you turn on a soap opera or a late-night talk show. With the flick of a wrist, you're inviting *telefriends* into your home. For the next half-hour or hour, the friends are the center of attention for you and your family. You listen to whatever they say. You laugh at their jokes or grow solemn when they tell a sad story. You see their faces on the TV screen just as if you were close together having an intimate conversation.

This is virtual reality.

Virtual reality is a shortcut across time and space. Through powerful media such as books, TV, radio, telephones, videotapes, satellites, robot sensors, and fiber optics, we can experience events that would be impossible to experience in our real bodies.

Cyberspace, on the other hand, is a world laced with high-speed electronic highways that connect computer to computer. Cyberspace is invisible yet everywhere. Already computers ring the globe, transmitting trillions of facts and figures to other computers, where they are transformed, stored, or communicated to human beings who peer anxiously into cyberspace through the flickering windows of their display screens.

In the next few years, cyberspace will merge with virtual reality. New, multimedia computers will be able to process the text, images, sounds, and voices that create the worlds of virtual reality. As more media (publishing, telephone conversations, movies, video, speeches, music, works of art) are digitized, they will enter the world of cyberspace. Cyberspace will take on a human "look and feel" with its thousands of movies, news documentaries, digital hi-fi copies of famous speeches, and photographs of real-world objects. It will become a giant three-dimensional, multimedia database that humans can enter and explore.

With the computer's speed, we will have control over every word that's said, every frame of video that's shot, every page of every book, magazine, or newspaper ever written—in a second. And we will be able to blend, transform, and combine images, words, and sounds into personal compositions and hyperreal adventure games and simulations.

The Layers of the Virtual Onion

You might think of cyberspace as a three-dimensional universe, a sphere—a digital onion. The onion currently has only one or two layers, but new ones are swiftly forming.

At the innermost layer are labyrinthine webworks of voltage levels, electronic signals, pulses of light, beeps, and boops. This is the 1940s world of purely computer symbols.

One layer above, we find a world of human symbols: words and numbers. This is cyberspace in the 1950s through the 1980s.

In the future, new layers will form atop the old. As we enter cyberspace in the 1990s, we find photographs, moving images, colorful computer graphics and animations, fragments of human speech, clips from movies, popular songs, and sound effects like barking dogs and backfiring automobiles.

The highest level of cyberspace will form at the dawn of the new millenium. In the twenty-first century, cyberspace will become virtual reality, infinite recreations of the real world, multimedia databases that are overwhelmingly interactive and shockingly realistic. At this level, the computer will be a magic carpet that can take us to any time or place; we'll press a Play button and watch reality unfold. Or we'll pause reality or rewind it.

A Pandora's Box?

We'll eventually have hundreds of gateways into cyberspace, not just the primitive keyboards, mice, joysticks, and display screens that we have today. We will be able to journey into cyberspace with our whole bodies and minds. Our rooms will darken, holographic images will leap from the walls, and we'll be off on a voyage into simulations of the real world or of fictional worlds of the imagination. All knowledge will be available to us—as a visual metaphor, as a real-world person or event, or as matrices of images, tables of numbers, or anything we desire. Every spot on our planet will be within our casual reach. Teachers will turn out the lights in the classroom and take their students on electronic field trips along the Oregon Trail, across a Himalayan Pass, through the Straits of Magellan, on a corkscrew journey around a helix of DNA, or hopping among the neurons of the brain.

Virtual reality will blot out time and space for our society, our economy, and our world. We'll have absolute control, instant by instant, over everything that occurs.

Yet we'll still live in the real world, locked inside real bodies—young and old, healthy and infirm. The attractions of virtual reality might become overwhelming. But might they not also be fatal? G

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feedback

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64/128 Screen Store

I want to create BASIC text windows and option menus on my 64 that would disappear with the press of a key to reveal the previous screen. There have been a few BASIC and machine language routines that can do the job, but most of these use up a fair amount of memory or require a very long BASIC loader.

The ideal routine would be in the form of machine language stored in DATA statements. It would be able to store and retrieve colors as well as text and be completely relocatable to avoid conflict with other utilities. Can you provide me with a solution?

Steve Oblas
Bethlehem, PA

Below is a short machine language routine in the form of a BASIC loader for the 64 that stores the text screen—including color data—in RAM underneath BASIC ROM (beginning at $A000) and later retrieves it.

```
XM 5000 REM 64 SCREEN STORE
EQ 5010 SS=49152
DF 5020 FOR I=SS TO SS+120:REA
        DA:POKEI,A:CK=CK+A:NEX
        T
HF 5030 IF CK<>14521 THEN PRIN
        T"ERROR IN SCREEN STOR
        E DATA":STOP
HB 5040 PRINT"{CLR}SYS"SS+3"ST
        ORES THE SCREEN":PRINT
        "SYS"SS"RECALLS IT"
BP 5050 FORI=1TO2000:NEXT
FR 5060 DATA 24,144,54,160,0,1
        85,0,4,153,0,160,185,0
        ,5
XM 5070 DATA 153,0,161,185,0,6
        ,153,0,162,185,232,6,1
        53,232
CS 5080 DATA 162,185,0,216,153
        ,0,164,185,0,217,153,0
        ,165,185
BS 5090 DATA 0,218,153,0,166,1
        85,232,218,153,232,166
        ,200,208,205
QD 5100 DATA 96,165,1,72,41,25
        4,133,1,160,0,185,0,16
        0,153
MD 5110 DATA 0,4,185,0,161,153
        ,0,5,185,0,162,153,0,6
EP 5120 DATA 185,232,162,153,2
        32,6,185,0,164,153,0,2
        16,185,0
EK 5130 DATA 165,153,0,217,185
        ,0,166,153,0,218,185,2
        32,166,153
SC 5140 DATA 232,218,200,208,2
        05,104,133,1,96
DR 5150 REM EXAMPLE
BB 5160 PRINTTAB(14)"{CLR}
        {WHT}*{CYN}PRESS A KEY
         TO STORE{WHT}*{7}":RE
        M PUT SOMETHING ON THE
         SCREEN
KR 5170 GETA$:IFA$=""THEN5170
SK 5180 SYSSS+3:REM STORE IT
RB 5190 PRINT"{CLR}PRESS ANY K
        EY TO RESTORE OLD SCRE
        EN"
XF 5200 GETA$:IFA$=""THEN5200
AS 5210 SYSSS:REM RESTORE OLD
        {SPACE}SCREEN
```

To install this routine, just run the program. At the end of the listing are a few lines (5150–5210) that show how to use the routine. To store the current screen, execute the command SYS 49155 from either program or direct mode. To recall the previously saved screen, enter SYS 49152.

This routine is completely relocatable. To move it to location 828 (the cassette buffer), for example, you'd assign the variable SS in line 5010 a value of 828.

To include this screen-storage routine in your own programs, delete the example portion of the program (lines 5150–5210) and then substitute the following line.

5040 RETURN

Another routine similar to this one appeared in "Feedback" in April 1989 under "64 Screen Saver." This particular routine saved the text screen to disk rather than to memory. You might want to look at it for comparison purposes.

The program below contains an equivalent screen-storage routine for the 128, also written in machine language. The 128 version works on either the 40- or 80-column screen. It stores the screen—again, both text and color data—in memory just after the machine language routine itself. Unlike the 64 version, the 128 version is not relocatable.

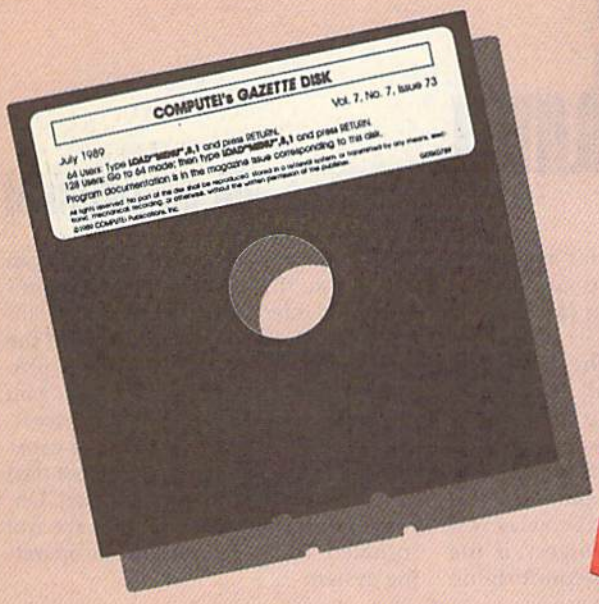
```
XJ 100 REM 128 SCREEN STORE/RE
       CALL
QX 110 REM SYS 4867 TO STORE
DA 120 REM SYS 4864 TO RECALL
SQ 130 CK=0:BANK15
XD 140 FOR I=4864 TO 5067
PP 150 READA:CK=CK+A:POKE I,A:
       NEXT
RJ 160 IF CK<>21891 THEN PRINT
       "ERROR IN DATA":STOP
ES 170 DATA 76,69,19,165,215,2
       08,10,162,0,32,147,19,1
       62,1,76,147,19,32
MX 180 DATA 57,19,169,0,162,32
       ,32,135,19,162,33,32,13
       5,19,162,19,32,135
KK 190 DATA 19,169,16,162,18,3
       2,135,19,160,16,169,250
       ,162,30,32,135,19,136
AD 200 DATA 208,246,96,162,24,
       32,123,19,9,128,162,24,
       76,135,19,165,215,208
BQ 210 DATA 10,162,2,32,147,19
       ,162,3,76,147,19,32,57,
       19,169,0,162,18
BA 220 DATA 32,135,19,162,19,3
       2,135,19,162,33,32,135,
       19,169,16,162,32,32
QK 230 DATA 135,19,160,16,169,
       250,162,30,32,135,19,13
       6,208,246,96,142,0,214
JB 240 DATA 174,0,214,16,251,1
       73,1,214,96,142,0,214,1
       74,0,214,16,251,141
BJ 250 DATA 1,214,96,189,188,1
       9,133,251,189,192,19,13
       3,252,189,196,19,133,25
       3
AX 260 DATA 189,200,19,133,254
       ,160,232,162,4,177,251,
       145,253,136,192,255,208
       ,247
RH 270 DATA 198,252,198,254,20
       2,208,240,96,0,0,43,19,
       7,219,23,27,43,19
FK 280 DATA 0,0,23,27,7,219,18
       9,246,19,133,252,189,25
       2,19,133,253,189,2
XC 290 REM EXAMPLE
AP 300 PRINT"{CYN}":LIST:REM P
       UT SOMETHING ON SCREEN
BD 310 SYS4867:REM STORE IT
GE 320 PRINT"{WHT}":DIRECTORY:
       REM REPLACE WITH DIRECT
       ORY
SS 330 PRINT"PRESS ANY KEY TO
       {SPACE}SEE OLD SCREEN"
XK 340 GETA$:IF A$="" THEN 340
FP 350 SYS4864:REM RESTORE OLD
        SCREEN
```

As with the 64 version, the last few lines of the program (lines 290–350) contain an example of the routine's use. The command SYS 4867—entered from direct or program mode—stores the current screen while the command SYS 4864 restores it.

To include the 128 routine as a subroutine in your own programs, delete all of the lines from 290 on and then add the following line.

165 RETURN

G



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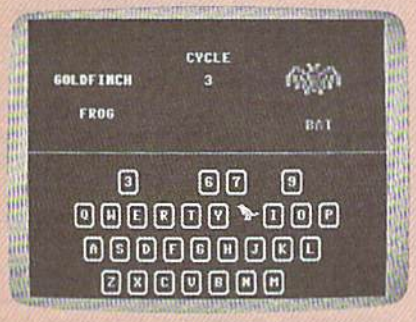

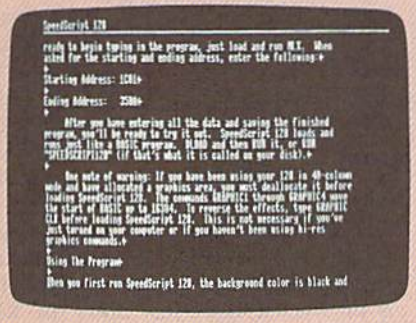

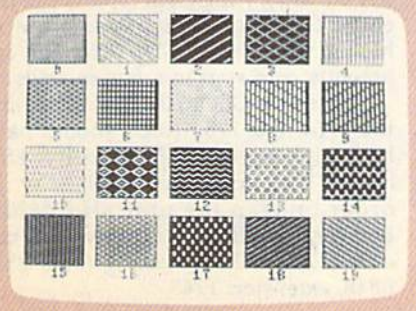

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THE geos column

Closeup on GEORAM

Robert Bixby

With Berkeley Softworks' new RAM expansion unit, you can upgrade your 64 to a 576K behemoth (or your 128 to 640K) and run your GEOS applications like greased lightning.

Until now the good news and the bad news about GEOS for the 64 and the 128 was that GEOS could make very creative use of the RAM expansions for those computers. GEOS treated the 1764 like a 1541 ramdisk for the 64 and the 1750 like a 1571 ramdisk for the 128.

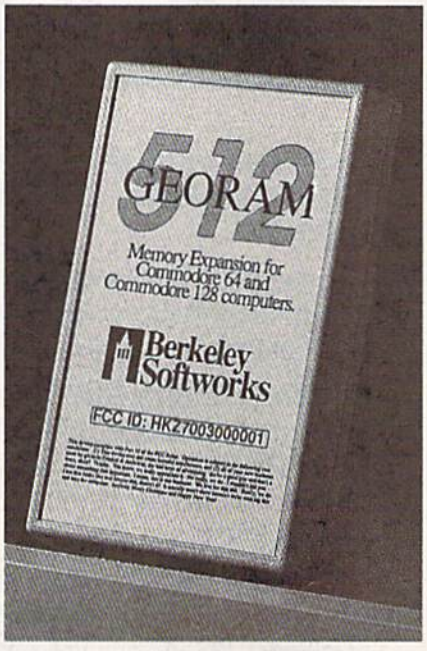
So why good news *and* bad news? The good news was that a ramdisk sped up GEOS so much that it made using a disk-intensive program like *geoPaint* effortless and fluid. The bad news was that the RAM expansions were very expensive and difficult to find. Also, 64 owners complained, and rightfully so, that they were being left out of the RAM race: The RAM expansion for the 64 was only 256K. Worse, it required a special power supply, adding unnecessarily to the price.

Recognizing the difficulty of the situation, Berkeley Softworks engineer Dave Durran created GEORAM, a RAM expansion unit to be marketed specifically for use with GEOS. GEORAM is inexpensive ($125), fast, and efficient. By using high-speed CMOS technology, GEORAM's power consumption was kept to an average current drain of only 80 milliamperes.

The unit doesn't look like the 1750 and 1764 units. The box that contains the RAM is roughly half as wide as the Commodore units and about an inch longer. When connected, it rests on the desk behind the computer and plugs into the cartridge port. The connector that plugs into the computer isn't shielded like the one on the Commodore units and it must be plugged in with care, but the overall construction is superior to that of the Commodore units. One of the most striking features of GEORAM is that you can see its chips and resistors on a section of the circuit board that juts out of the end of the unit near where it plugs into the cartridge port. Why? Roughly 2–5 percent of Commodore 64s cannot use GEORAM as shipped. Users will know their computers are incompatible because either their computers will boot up normally but the cursor won't appear, or the screen will come up completely white and nothing further can be done with the computer.

In order to make the GEORAM compatible with these balky 64s, resistor R2 must be clipped out of the GEORAM circuit. The resistor is visible on the exposed circuit board of the RAM expansion unit. The user can make this alteration very easily, but Berkeley will perform the necessary surgery if the new owner doesn't feel comfortable about doing it.

GEORAM is shipped with a new version of GEOS that makes use of the advanced capabilities of the RAM expansion unit. If you already have GEOS 2.0 for either the 64 or the 128, you can simply use the new configuration program provided with the RAM expansion unit. If you haven't purchased the new operating system, the disks provided with GEORAM will provide you with a new deskTop, printer drivers, and the broad array of GEOS 2.0 capabilities described in these pages last year when GEOS 2.0 was released. Unfortunately, the applications are not included. You get only the basic operating system.



GEORAM access is 35 times as rapid as standard GEOS disk access time. That's only the most obvious benefit.

Ramdisk to the Rescue

Most users know that GEOS features supercharged disk capabilities that make Commodore disk access 7 times faster. GEORAM access is 35 times as rapid as standard GEOS disk access time. That's only the most obvious benefit of using a ramdisk. Here are some others: A ramdisk allows you to *shadow* your disk drive. This feature is roughly the same as operating a disk-cache system on a PC, saving disk access time by keeping copies of important data in RAM so that, if it has to be loaded in the future, it's instantly available. You can also shadow the directory of the 1581 drive, thus saving the time it normally takes to load the directory when that drive is selected.

Another benefit of a ramdisk is that it offers the ability to keep many GEOS features in memory at one time. Normally, GEOS would be unable to keep the information necessary to work with two different types of disk drives in memory at the same time. GEORAM allows the additional information to be stashed in a hidden area for recall as it's needed. GEORAM can also hold reboot information, allowing you to return to GEOS quickly from a BASIC program simply by loading RBOOT from one of the drives (or, if a copy of the deskTop is on the ramdisk, just press the RESTORE key), which will rapidly call the entire GEOS operating system out of hiding, bringing up GEOS from an apparently cold start in a few seconds.

In short, GEORAM has everything the 1764 and 1750 REUs should have had: high-speed, high-capacity, efficiency, low price, and availability. In order to keep the unit affordable, Berkeley is selling it directly. You can order GEORAM by calling (800) 888-0848, extension 1745. **G**

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BASIC for beginners

The Timers

Larry Cotton

This month and next, we'll discuss the Commodore 64's timers and how to access them in BASIC. Actually, the 64 features two built-in timers—one which is quite accurate, the other which is not so accurate. We'll write a short program which makes use of the not-so-accurate timer for measuring reaction times. First, a bit about the timers themselves.

As you know by now (if you've followed this column), when you use variables in your programs, you have to be somewhat careful in naming them. For instance, NUMBER = 6 is valid, but TIME = 6 is not. That's because NUMBER (NU) is not a reserved variable, while TIME (TI) is. How are you supposed to know which variables are reserved and which are not? The best way is to consult your *Programmer's Reference Guide*. You'll find that two variables—TI and TI$—are reserved for the timers.

TI and TI$

Turn on your computer. (If it's already on, turn it off and then back on.) Immediately after you see the word READY and the blinking cursor, enter PRINT TI and press RETURN. You should see a number printed on the screen. Again, enter PRINT TI and press RETURN. Another number—this time larger—will be revealed. If you continue doing this, you'll see increasingly larger numbers. What's going on here?

When you first turn on your computer, an internal clock, which Commodore calls the *jiffy clock*, immediately starts ticking every 1/60 second. In fact, Commodore calls these fractional seconds *jiffies*. So, the numbers you've just seen are the number of jiffies which have elapsed since you turned on the computer.

In program mode, you can see the jiffy clock as it rapidly increments by entering and running the following one-liner.

```
10 PRINT TI"{UP}":GOTO 10
```

Now, if you type TI=0, you'll get a syntax error since TI is a *read only* variable. You can set it, however, by using the other timer-reserved variable, TI$. When you enter PRINT TI$, you'll see a six-digit number in a particular format: HHMMSS. The *H*'s stand for hours; the *M*'s, for minutes; and the *S*'s, for seconds.

The reserved variable TI$ counts from 000000 (the instant you switch on the computer) to 235959 (23 hours, 59 minutes, and 59 seconds later), and then it starts over. So, if TI$ is 042307, for instance, your computer's been on for about four hours, 23 minutes, and seven seconds. I say "about," because the jiffy clock is not really too accurate. (More on that next month.)

To zero TI and TI$ while the computer is running, enter TI$="000000". Then PRINT TI or PRINT TI$ a few times to verify that the jiffy clock has actually been reset. We can set TI$ for any time that we like—including the actual time. Try it. For example, if it's 9:15 a.m., you'd enter TI$="091500" and press RETURN. From then on, when you enter PRINT TI$, you'll see the correct time—more or less. Incidentally, the maximum value of TI is 5183999 (24 × 60 × 60 × 60 − 1); TI$'s highest value is "235959".

On Your Mark

Now that we understand the basics of TI and TI$, let's begin entering the reaction-timing program. In the process, we'll learn a few new things about BASIC. First, let's color the screen and border black with two POKEs that we've used before. At the same time, we'll clear the screen and define a few variables.

```
10 POKE 53280,0:POKE 53281,0:PRINT
   CHR$(147):BT=100:FL=1:I=1:L=39
```

Now, we'll enter a line which we used when we studied the RND (random) function. This line uses TI to help ensure randomness of our first time delay.

```
20 RN=RND(-TI/101)
```

To time a user's reaction, we'll print a continously lengthening colored horizontal bar on the screen and wait for the user to press the space bar. The colored bar will be composed of inversed spaces, so let's define that character.

```
30 C$=CHR$(18)+CHR$(160)
```

CHR$(18) changes what follows to an inversed character, and CHR$(160) is the space. Thus, C$ is an inversed space. Let's give the program user a chance to choose how many times he or she wants to check reaction time.

```
40 INPUT "{DOWN}{WHT}HOW
   MANY BARS (MAX. 15)";NB:IF NB<1
   OR NB>15 THEN PRINT"{3 UP}"
   :GOTO 40
```

We've used INPUT and IF-THEN to gather the user's response and to restrict it to a reasonable limit. Now let's give the user a message.

```
50 PRINT "{CLR}{2 DOWN} PRESS
   SPACE BAR WHEN YOU SEE
   SOMETHING."
60 PRINT "{DOWN}NUMBER AT END
   OF BAR IS REACTION TIME"
   :PRINT "{DOWN}IN SECONDS. ";
70 IF GL=0 THEN GL=1:PRINT
   "PRESS SPACE BAR TO START.";
   :GOTO 90
80 PRINT "{DOWN}PRESS SPACE BAR
   TO START AGAIN."
```

Get Set

Note the slightly different wording in lines 70 and 80. The first line is used only for the first colored bar; the second is used for subsequent bars. Now we wait for the user to read the message.

```
90 GET A$:IF A$<>"{SPACE}" THEN
   90
```

This is a standard wait-for-user-response loop. It waits patiently for the user to press the space bar. When he or she does, the action begins.

```
100 PRINT CHR$(147):FOR U=1 TO
    INT(800*RND(1))+30:NEXT U:POKE
    198,0:PRINT "{RED}";
```

This clears the screen and pauses for a random amount of time. After this, the keyboard buffer is cleared (with POKE 198,0) and the cursor color is changed to red. Using a pause of unpredictable length here helps eliminate any anticipation factor on the part of the user. At the end of the pause, we print the first inversed space of the bar and set the jiffy clock to 0.

```
110 PRINT C$;:TI$="000000"
```

Go!

The value of TI is now 0, and the reaction timer is running. Carefully note the semicolon after C$; this makes the timing bar's inversed spaces print one after the other. Now let's look at the keyboard to see if the user has reacted to the appearance of the bar's first character. It's unlikely, but we must check.

```
120 K=K+I:GET A$:IF A$<>"{SPACE}" THEN PRINT C$;:IF
    K<L THEN 120
```

The variable K is incremented by 1 each time an inversed space is printed. It's used to determine if the bar has gotten to the right edge of the screen. If it has, the user has a very slow reaction time or isn't paying attention to the test.

The IF-THEN statement compares the increasing value of K to L (set to 39 in line 10). If it's less than 39, the edge of the screen hasn't been reached yet. The program loops back to the beginning of the line, increments K, looks at the keyboard for a press of the space bar, and continues to PRINT inversed spaces, forming a longer and longer horizontal bar.

If the bar does reach the edge of the screen, we need to reset our character counter to 0 and inform the user of his or her abysmal performance.

```
130 IF K=L THEN K=0:PRINT:PRINT"{WHT} TOO LATE!"
    :GOTO 230
```

Since I've finished this program and know it's relatively short, I've used a GOTO here instead of a GOSUB. However, for more elegant and efficient programming (especially with longer programs), subroutines would be preferred.

What's Your Reaction?

OK, the user has pressed the space bar, so we must look at the value of TI.

```
140 J=TI:K=0
```

The variable J becomes whatever TI is at this particular instant and K—the character counter—is reset to 0. Now let's do some math to convert the reaction time J from jiffies to seconds. Then, we'll round off the resulting number to two decimal places.

```
150 J=J/60:J=INT(J*100+.5)/100:PRINT J;:PRINT
```

Notice that the variable J has several uses in this line. First, it's the reaction time in jiffies. Then, it's the reaction time in seconds, accurate to several decimal places. And lastly, its value is rounded to two places and printed in inversed characters at the end of the horizontal bar.

As long as the space bar is pressed, we don't want anything else to happen. To make sure that nothing does, we use another special memory register, location 197.

```
160 IF PEEK(197)=60 THEN 160
```

We saw in our musical keyboard from the December column how PEEK(197) is used. You'll recall that location 197 is the memory register for the keyboard matrix. In this case, as long as the space bar is being pressed, the computer remains in a loop. When the space bar is released, we want two things to occur: We want the keyboard buffer to be cleared again and the value of TL, which starts out as 0, to be incremented by J. The variable TL represents the total of all the reaction times, which will later be used to find the average reaction time.

```
170 POKE 198,0:TL=TL+J
```

The Bar Counter

We now need to introduce another counter D, which keeps track of the number of times a colored bar is printed. We compare this to the number of bars the user specified (the value NB that was input in line 40).

```
180 D=D+1:IF D=NB THEN 240
```

We've run out of space for this month. See if you can finish the program for yourself. In the remainder of the program, which we'll see next month, I've alternated between red and cyan bars, made provision for reacting too soon to the bar's movement, and printed average and best reaction times. **G**

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THE programmer's page

Custom Keyboards

Randy Thompson

Unless you've confused your computer by plugging in a joystick while the power is still turned on, you probably think that the 64's keyboard layout is pretty much set in stone: You press the A key and you get an *A*, RETURN always enters commands or program lines, and the cursor keys never fail to move your cursor.

Of course, it doesn't have to be that way.

Thanks to the 64's flexible operating system, you can customize your keyboard using a simple machine language program. You can make the A key enter Z's, RETURN can be redefined to delete characters, and the cursor keys can emulate the function keys or any other keys available to the 64.

Alpha Lock

Other than confusing your friends, neighbors, and family members, rearranging your keyboard has other practical applications. For example, have you ever wished your computer had an ALPHA LOCK key? Unlike the existing SHIFT LOCK key, which places *all* keys into their shifted position, an ALPHA LOCK key would shift only the letter keys. With an ALPHA LOCK key, you could enter uppercase letters without having to unshift to enter numbers or to make editing changes (if you haven't noticed, SHIFT LOCK affects even the INST/DEL and cursor keys).

The listing for an ALPHA LOCK program appears below. This is a BASIC loader that stores the program's machine language code into memory and then executes it. As written, the code is stored in the 64's cassette buffer starting at memory location 828. If you prefer, you can change the program's starting address by changing the value assigned to the variable SA in line 100.

```
SK 100 SA=828
KM 110 FOR I=SA TO SA+118:READ
       D:POKE I,D:NEXT
PA 120 A1=SA+13:H1=INT(A1/256)
       :L1=A1-H1*256
DQ 130 A2=SA+54:H2=INT(A2/256)
       :L2=A2-H2*256
PM 140 A3=SA+55:H3=INT(A3/256)
       :L3=A3-H3*256
GH 150 POKE SA+2,L1:POKE SA+7,
       H1
AA 160 POKE SA+28,L2:POKE SA+2
       9,H2
KP 170 POKE SA+33,L2:POKE SA+3
       4,H2
BJ 180 POKE SA+39,L2:POKE SA+4
       0,H2
QQ 190 POKE SA+44,L3:POKE SA+4
       8,H3
KD 200 SYS SA
ED 210 REM MACHINE CODE
DR 220 DATA 120,169,0,141,143,
       2,169,0
EP 230 DATA 141,144,2,88,96,17
       3,141,2
HG 240 DATA 240,20,201,5,208,1
       3,205,142
DA 250 DATA 2,240,8,173,0,0,73
       ,255
JM 260 DATA 141,0,0,76,72,235,
       173,0
XP 270 DATA 0,240,248,169,0,13
       3,245,169
BR 280 DATA 0,133,246,76,224,2
       34,0
EG 290 REM ALPHA LOCK DECODE T
       ABLE
AQ 300 DATA 13,13,29,136,133,1
       34,135,17
QJ 310 DATA 51,215,193,52,218,
       211,197,1
FJ 320 DATA 53,210,196,54,195,
       198,212,216
JF 330 DATA 55,217,199,56,194,
       200,213,214
HH 340 DATA 57,201,202,48,205,
       203,207,206
PF 350 DATA 43,208,204,45,46,5
       8,64,44
QB 360 DATA 92,42,59,19,1,61,9
       4,47
XH 370 DATA 49,95,4,50,32,2,20
       9,3
QE 380 DATA 255
```

When you first run this program, nothing appears to happen. Now press SHIFT-CTRL. This is the key combination that activates the ALPHA LOCK feature. All of the alphabet keys should now produce uppercase letters or graphics characters, depending on the mode your computer is in (press SHIFT-Commodore to toggle between upper-/lowercase and graphics modes). Pressing SHIFT-CTRL again returns the keyboard to normal. By the way, ALPHA LOCK works fine with such programs as *SpeedScript* and *PaperClip*. In fact, it's a very useful addition.

Programs that activate Commodore's key-repeating feature make activating ALPHA LOCK a little difficult. Because keys automatically repeat in this mode, you may accidentally turn ALPHA LOCK on and off in just one keypress. If this is the case, try holding down the SHIFT key and tapping the CTRL key sharply—much as you might press RUN/STOP-RESTORE. This should prevent any unwanted toggling of ALPHA LOCK.

While the ALPHA LOCK program doesn't exactly rearrange your keyboard, it does rewrite the computer's keyboard decode table. And once you know how to do that, you can make the computer keys return any ASCII value you wish.

Keyboard Decode Tables

The 64 uses a 6526 complex interface adapter (CIA) chip to read the computer's keyboard. By reading the 6526's registers, the computer derives the matrix code of a key. This matrix code is then used to index into a *keyboard decode table* to find the key's ASCII equivalent. So, it's the keyboard decode table that determines what character is returned by each key on the keyboard. (The RESTORE key is not wired to the 6526, so its function is not affected by decode tables.)

There are four decode tables; one for normal characters, one for shifted characters, one for Commodore characters, and one for CTRL characters. What the program above does is create a *fifth* table—a table for ALPHA LOCK characters. This table is the same as the decode table for shifted characters, except that only the A–Z keys are represented as shifted.

Located in Kernal ROM is a routine that's responsible for determining which keyboard decode table to use. According to whether or not the SHIFT, Commodore, or CTRL key is being pressed, this routine sets memory locations 245 and 246 ($F5 and $F6) to point to the appropriate keyboard decode table. Fortunately, this routine is vectored through memory locations 655 and 656 ($28F and $290). Normally, this vector points to 60232 ($EB48), but the ALPHA LOCK program changes it to point to its own routine. This routine's first task is to check for the SHIFT-CTRL key combination. If it's pressed, a special ALPHA LOCK flag is toggled on or off. If the SHIFT, Commodore, or CTRL key isn't being pressed and the ALPHA LOCK flag is set, memory locations 245 and 246 are set to point to the ALPHA LOCK decode table. This, in effect, creates an ALPHA LOCK key.

Making Your Own

Using the ALPHA LOCK program as a shell, it's easy to make your own keyboard configurations. You can give your computer a numeric keypad, a Dvorak keyboard, or any other setup that you want. Instead of switching in the ALPHA LOCK decode table, just switch in a table of your own making.

Lines 300–370 in the BASIC listing above contain the decode table that's activated by SHIFT-CTRL. Each number contained in these DATA statements corresponds to a key on the keyboard. The first number, for example, determines the ASCII value returned by the DEL key. If you change the 20 to 65 and run the program, hitting the DEL key will enter the letter *A*. Change the 20 to 5, and the DEL key will change the cursor color to white. So, the only trick to changing your keyboard layout is knowing which number corresponds to which key.

The keyboard decode table is not arranged alphabetically or numerically; it's organized by how the keys are physically arranged on the keyboard. The following chart shows you this order and how it relates to the DATA statements in the ALPHA LOCK program.

360 INS/DEL, RETURN, CSR left/right, F7, F1, F3, F5, CSR up/down
370 3, W, A, 4, Z, S, E, left SHIFT
380 5, R, D, 6, C, F, T, X
390 7, Y, G, 8, B, H, U, V
400 9, I, J, 0, M, K, O, N
410 +, P, L, −, ., :, @, comma
420 £, *, ;, CLR/HOME, right SHIFT, =, ↑, /
430 1, ←, CTRL, 2, space bar, Commodore, Q, RUN/STOP

If you look closely at the table above, you'll see the Commodore key, CTRL key, and the SHIFT keys listed. Although they're listed in the table, you can't change the function of these keys by changing their decode-table value.

A Couple of Examples

To get you started, I've compiled a couple of my own alternative keyboard decode tables. The first simulates a Dvorak keyboard. The second adds a numeric keypad, changing the M, J, K, L, U, I, and O keys so they act as the number keys 0 through 6. The number keys 7, 8, and 9 appear above this cluster of keys, completing the keypad.

To use either of these decode tables, simply load in the ALPHA LOCK program shown above and replace lines 290–370 with one of the two listings shown below. Next, run the program and tap SHIFT-CTRL. Your new keyboard is now ready for use. (Remember: To return things to normal, just press SHIFT-CTRL again.)

Dvorak Keyboard

```
PQ 290 REM DVORAK DECODE TABLE
HR 300 DATA 20,13,29,136,133,1
       34,135,17
KE 310 DATA 51,44,65,52,59,79,
       46,1
QB 320 DATA 53,80,69,54,74,85,
       89,81
GE 330 DATA 55,70,73,56,88,68,
       71,75
AA 340 DATA 57,67,72,48,77,84,
       82,66
XK 350 DATA 43,76,78,45,86,83,
       47,87
QS 360 DATA 92,42,45,19,1,61,9
       4,90
FP 370 DATA 49,95,4,50,32,2,39
       ,3
QE 380 DATA 255
```

Numeric Keypad

```
EP 290 REM NUMERIC KEYPAD DECO
       DE TABLE
HR 300 DATA 20,13,29,136,133,1
       34,135,17
JF 310 DATA 51,87,65,52,90,83,
       69,1
QG 320 DATA 53,82,68,54,67,70,
       84,88
HK 330 DATA 55,89,71,56,66,72,
       52,86
GJ 340 DATA 57,53,49,48,48,50,
       54,78
PM 350 DATA 43,80,51,45,46,58,
       64,44
QB 360 DATA 92,42,59,19,1,61,9
       4,47
FS 370 DATA 49,95,4,50,32,2,81
       ,3
```

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machine language programming

Interrupt Programming

Jim Butterfield

It's often confusing to read about interrupt programming. Part of the problem is this: The 6502-based chip itself handles interrupts in a certain way, but the typical programmer sees the interrupt after it's been processed with extra code. Some of the more important points about interrupts are covered in the paragraphs which follow.

An Overview

There are two kinds of interrupt: IRQ and NMI. The interrupt signal arrives at one of two pins on the microprocessor chip. Whichever interrupt is invoked, the same thing happens: The current instruction is completed, essential data is pushed to the stack, and then the processor *vectors* to an interrupt-handling program. The address to which the processor will go—the vector—is stored at locations $FFFE–$FFFF (65534–65535) for an NMI interrupt, and at $FFFA–$FFFB (65530–65531) for an IRQ interrupt.

There are primarily two differences between an IRQ and an NMI interrupt. The first is that an IRQ interrupt can be masked or blocked by use of the SEI (SEt Interrupt disable) command. The NMI (Non-Maskable Interrupt) cannot be blocked; it takes effect whether or not the interrupt disable bit in the status register has been set.

The second difference is that the IRQ is level-triggered. This means that whenever a certain voltage is present at the IRQ pin, the processor will go into its interrupt action unless masked. Suppose that this has happened, and the processor has done all its interrupt work, concluding with RTI (ReTurn from Interrupt). If the voltage is still present at the pin, the processor will immediately interrupt again. This means that the programmer must be sure that the interrupt program turns off the interrupt signal.

The NMI, on the other hand, is edge-triggered. When the voltage on the NMI pin switches from off to on, the voltage change (the *edge*), will cause the NMI interrupt to occur. In principle, there is no need to turn off the NMI signal, since the NMI will not trigger again until a new edge is seen. In practice, you often want to turn off the NMI signal since you can't get a new edge trigger until the voltage has been released to its rest state.

On Commodore machines, we don't control the interrupts at their normal hardware vector addresses; these addresses are fixed in ROM. Instead, we're given secondary software addresses where our programs can take control. By the time the interrupt program gets to these secondary addresses, it has done some extra work, such as saving registers A, X, and Y. On the Commodore 64, 128, and VIC-20, these software interrupt vectors are at $314–$315 (788–789) for the IRQ, and at $318–$319 (792–793) for the NMI.

On the 64 and VIC-20, the IRQ is set up to trigger 60 times per second. The interrupt program does useful work on the cursor, the keyboard, and the clock, so you must not switch it out unless you do so briefly. On the 128, the IRQ might be triggered more often, usually to create music or screen effects.

The central principle of interrupt coding is this: Keep your interrupts as short as possible. Extra work, if needed, can usually be done by a background (noninterrupt) program.

A Quick Program

Let's write a very short interrupt-driven program. We'll point the NMI vector to it so that we can trigger it by pressing the RESTORE key (the RESTORE key connects directly to the NMI).

This program counts the number of times RESTORE is pressed. This value is displayed by BASIC (the background program). You can press RESTORE very quickly. Chances are that you won't be able to press this key as fast as the program can read it. Note that RESTORE, since it's not read by the IRQ routines, can be detected much faster than other keys.

Here's our program, written for the Commodore 64 only.

```
033C  INC  $0360
033F  JMP  (normal NMI code)
```

We'll use BASIC to divert the NMI vector to $33C (decimal 828). Whenever the RESTORE key is pressed, the value 1 is added to the contents of address $360 (decimal 864). Then the program goes to the normal NMI routine, which doesn't do anything unless the communications lines are active or the RUN/STOP key is being held down.

We POKE the above program into place from BASIC. BASIC also places the address of the normal NMI service routine into the program, taking it directly from the software vector at locations 792–793.

```
100 DATA 238,96,3,76
110 FOR J=828 TO 831
120 READ X:POKE J,X:NEXT J
130 POKE 832,PEEK(792)
140 POKE 833,PEEK(793)
```

Now that we've copied the NMI vector into our program, we change the NMI vector so that it points to our program. If the NMI were active, we could get into serious trouble halfway through the switch, when only half the address is changed. And remember that we cannot ever fully disable the NMI. But we should be safe here. Can you recognize the address $033C in the two bytes that we POKE?

```
150 POKE 792,60:POKE 793,3
```

The NMI is now connected to our program. Each tap on the RESTORE key advances the value in address $0360 (decimal 864). We initialize BASIC to whatever value is there and then track it.

```
160 X=PEEK(864)
```

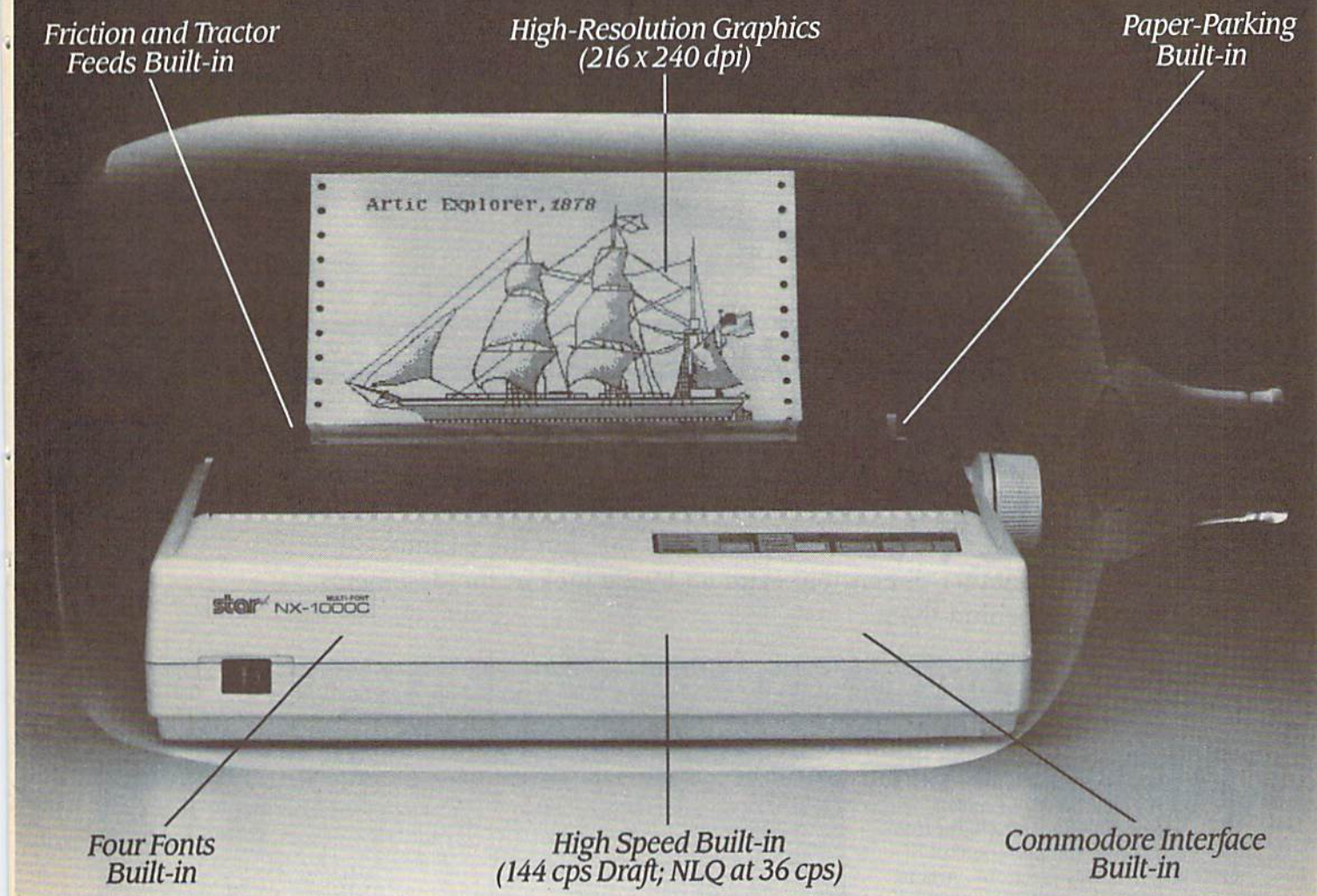
Now for the BASIC "following" loop and extra code to test for the program end.

```
170 Y=PEEK(864)
180 IF X=Y GOTO 220
190 N=N+1
200 X=X+1:IF X=256 THEN X=0
210 GOTO 170
220 IF N=N0 GOTO 250
230 N0=N
240 PRINT N;"RESTORE PRESSES
    DETECTED"
250 GET K$:IF K$="" GOTO 170
260 POKE 792,PEEK(832)
270 POKE 793,PEEK(833)
280 PRINT "PROGRAM ENDED."
```

The BASIC program isn't superfast. A quick finger on the RESTORE key can cause the pulses to come in faster than BASIC can count them. But BASIC eventually catches up as it tracks the interrupt's lightning-speed count.

Pressing a key other than RESTORE stops the program. At that time, the program tidies up by restoring the NMI vector to its original value. G

The new Star Multi-Font. How did Star get it all in there?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And the list of built-in features goes on—there's impressive speed in both draft and near letter quality. And an automatic single sheet feed. Plus, a paper-parking mechanism that lets you use single sheets without removing tractor paper. And the Multi-Font's easy-to-use push button control panel gives you command of over thirty-five functions.

Whether it's for serious work or serious play, the Star NX-1000C Multi-Font has so much built-in, you'll get more out of your Commodore. To find out where you can see the Multi-Font, call 1-800-447-4700.

star micronics

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Multi-Font printout produced by Flexidraw 5.5 graphics software by Inkwell Systems.

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STATE·OF·THE·ART Sports

HOT New Games That Put the 64 in Overdrive

Tom Netsel

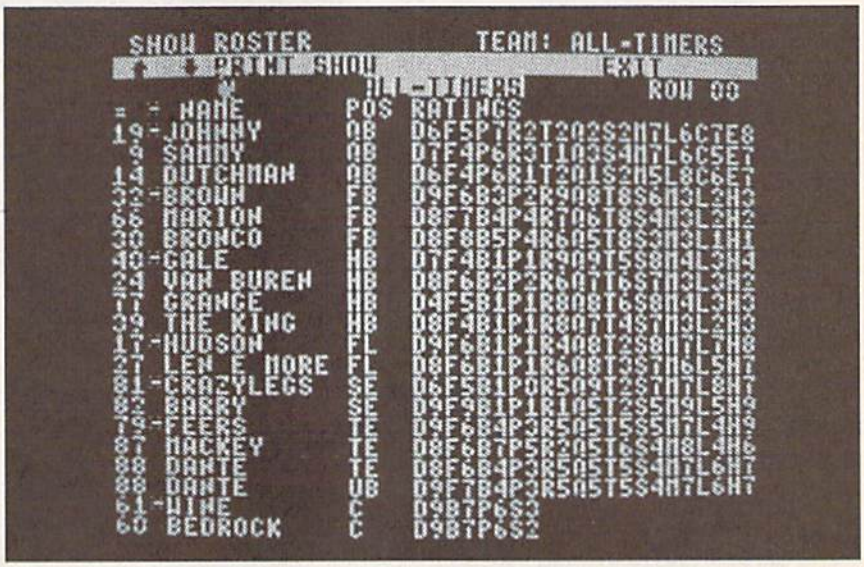
OK ••• so we've all heard about software that takes the 64 to its limits. But here are three new sports games that put the 64 into another dimension—and an inside look at the designers behind them.

John Madden Football

No detail is spared when two 11-men teams take the field in *John Madden Football*. From the opening kickoff to the closing gun, the performance of each player in this Electronic Arts release is based on such sports factors as speed, endurance, fatigue, passing, and running abilities. A real game often is affected by the weather, so you can call for heat, rain, cold, or snow when you play.

Madden works as an action game, where you control the players, or as a statistical game, where you call the shots as coach. Watch the action from behind and above the line of scrimmage and then move in closer once the ball is snapped. Graphics are not outstanding, but they adequately depict the actions and tasks of all 22 players.

When Robin Antonick, the designer of *John Madden Football*, finished his football days at Principia College in Illinois, his appetite for the game was far from satiated. His partners in his computer software business failed to express an interest in developing a football game, so Antonick took a week's vacation and spent 120 hours working on a prototype. Electronic Arts liked the initial program and a short time later agreed to a contract.



The rest is history—except for five years of work and development that went into the product before it hit the streets as *John Madden Football*. "I would guess that there were 12 to 15 man-years in the product before we shipped the first Apple version in 1989," Antonick says.

Antonick wanted to convey the feeling of teamwork he experienced

on a football team, where each player has a specific assignment for every play. He lets you choose from 20 offensive and 20 defensive tasks to assign each player in *Madden*. Have players run, pitch, hand off, pass, bump and run, blitz, play man to man, block punts, or return kicks. And just as human players have different talents, players also bring different skills to a game. Rate your players from 0 to 9 in as many as 11 different playing skills, including running, ball handling, speed, strength, and zone coverage.

About two years into the development of the game, John Madden was signed to the project. All the plays distributed with the game come from the playbook Madden used when he coached the Oakland Raiders. You can choose from about 80 offensive and 80 defensive plays that come in a book with each game, and you can design your own plays.

Madden added more than just his name to the package. He worked with Antonick and the staff in numerous sessions, providing valuable insight to the game of professional football. "He gave added depth that helped implement the product," Antonick says. "He made the product significantly deeper and made it more legitimate as a football simulation."

One of Madden's fundamental football concepts is the one-on-one match-up. He wants to know how his right guard matches up against the player's opposite number. If he has a positive match-up, Madden exploits that situation during a game.

In the Madden Report, you can compare two teams and find out where your positive match-ups are. When two players come into conflict, all their personal ratings are consulted and evaluated. If a player with a rating of 5 repeatedly goes against a player with a rating of 7, that play isn't going to work. These factors are all modeled. When teams with various strengths and weaknesses meet, what worked in one game may not prove successful in another. There's enough depth here to orchestrate a game on a player-by-player basis, the way Madden did.

If you don't care about going into that much depth, let the computer make decisions for you. There is also a Quick Game option. Call from only nine plays or grab the joystick and take control yourself.

Antonick is particularly proud of the game's artificial intelligence and the way players can be assigned tasks. A running back, for example, can be told to run, block, run for daylight, or check swing. Tell him to run and he goes a predetermined route. If he goes for daylight, he looks for a hole and selects his own path. In a check swing, he first looks to block a blitzing linebacker before moving out into the flat as a possible receiver.

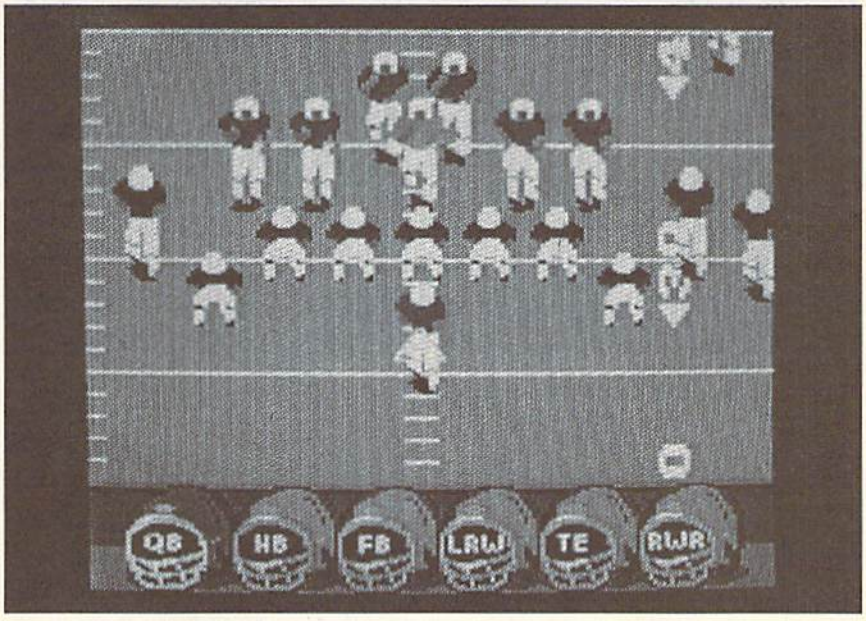
While Antonick has two or three game scripts in development, football is still his main interest. He wants to take the computerized version of the game to new levels, but it may take a while before he perfects it. "I feel I'll be able to do the ultimate football game in about ten years," he says.

ABC's Monday Night Football

Data East is a company whose roots are in arcade translations, but about two years ago it decided to enter the sports arena with a computerized football game. Its marketing strategy calls for a product that's known to the consumer, so officials searched for a name associated with football. "We sat down and brainstormed," says game producer Denny Thorley, "and, clearly, we felt the best football license available was 'Monday Night Football.' "

Data East officials contacted ABC and struck up a good relationship with the television network that produces the popular TV sports show that's watched each week during football season by more than 60-million viewers. Scott Orr was called in to design the game, and he was joined by Michael Knox and Troy Lyndon. *ABC's Monday Night Football* was on its way.

ABC provided videotapes, and sportscaster Frank Gifford read several scripts that were digitized and incorporated into the game. Some of the images for the game's optional cheerleaders came from footage taken from the 20th-anniversary show of "Monday Night Football."



"We knew what some of the competition had done, so we took the approach of bringing the player closer to the game," Thorley says. As a result, players are larger and are drawn with more detail than those found in *John Madden Football*. "And we really wanted to make an impact with the game's audio quality by including dig-

itized sound," Thorley adds.

Another area where Thorley felt they could make significant strides was in giving players different choices in play selections. Through focus testing, it was found that many players chose plays depending on how many yards they needed for a first down. Rather than thinking in terms of exact distances, they usually looked for plays good for short or long yardage and called for an appropriate play. "So we broke play selection down into short-, medium-, and long-play selections," Thorley says. Players can select from 30 offensive or nine defensive plays that best fit their needs.

With the *MNF* interface, once the quarterback has the ball, the player can cycle through and view all available receivers. The screen's view then changes to show whether the receiver selected is open or not. If a quarterback plans to pass but sees that his receivers are still running their patterns or are too closely guarded, he has the option of handing the ball off to a running back.

If you want to design your own plays, switch to the Playmaker Utility. "You actually control how the offensive line blocks, whether the tight end blocks or goes out on a pattern, and how the halfbacks move to the line," Thorley says. "You literally have control of all 11 players, and you can create your own playbook."

One unique *MNF* option allows two human players to compete against the computer. One acts as quarterback and hands or passes the ball to the other who then tries to evade the computer-controlled defense.

Players can tailor important team members to set a team's strengths and weaknesses. To make a quarterback a better passer, he gives up some running ability. Backs can be strong in running or handling, but not both. Receivers can be fast runners or good receivers. In this way, you can construct a team that has a strong running game or has a quarterback with a golden arm. ▷

Omni-Play Horse Racing

While the major team sports are well represented in the computer market, SportTime is a company that started off by producing sports games that wouldn't get lost in the competition. "One of the safest ways to do that is to take a sport that is not in the mainstream," says Ed Ringler, president of SportTime and designer of *Omni-Play Horse Racing*, *Omni-Play Basketball*, and other sports programs. "Everyone expects baseball or football, but the first main sport we did was *SuperStar Ice Hockey*."

That program proved successful, and other developers soon realized that ice hockey is a viable sport. Ringler still looks for unique products and strives for innovation.

"Horse racing is a major sport, but it had never been properly done," he says. "Perhaps its association with handicapping and gambling has kept many players away from it, but horse racing is considered the largest spectator sport in America. With that kind of marketing research upon us, it seemed strange not to offer that sport in a computer simulation."

Up to four human players can test their handicapping skills against

New Sports Titles on the Way

Accolade: New titles from Accolade arriving shortly are *Heatwave: Offshore Superboat Racing*, *Jack Nicklaus Presents the International Course Disk*, *The Cycles: International Grand Prix Racing*, *European Challenge*, *Muscle Cars*, and two scenery disks for *The Duel: Test Drive II*.

Cinemaware: *TV Sports: Football* offers a 28-team league, 16 games, and postseason playoffs. Graphics resemble what you'd see on television. Teams vary in their offensive and defensive abilities, and no two plays are ever executed alike. You can play against a friend or challenge the computer. While your game is under way, other league games are being played, and their running scores are displayed on your screen. This game is now available.

Data East: Its next release is *Bo Jackson Baseball*. (For details, see this month's "Commodore Clips" column.) The development team that created *Monday Night Football* is now working on a basketball product that should be out sometime in the fall. Contracts have yet to be signed, but it's expected that several NBA stars will be associated with it. It also will incorporate the downloading of statistics. "I promise you," producer Dennis Thorley says, "it will be the hottest basketball game going."

Electronic Arts: Driving enthusiasts should look for *Ferrari: Formula One* this spring.

Medalist International: Two new products are on the way. *Stunt Track Racer* offers three-dimensional speedways that rise hundreds of feet above the ground and includes several obstacle-covered tracks where each track requires a different driving skill. *RVF Honda* is a simulation of Formula One motorcycle racing with competition on eight national tracks, as well as International Circuit racing.

MicroLeague Sports: *MicroLeague Sports Wrestling* features digitized video action and real WWF stars, including Hulk Hogan. Strategy, not eye/hand coordination, determines the winners of these action matches.

19 computer opponents in *Omni-Play Horse Racing*. In addition to betting on Win, Place, or Show, players can expect big payoffs if they hit with a Triple, Exacta, or Quinella. The game is filled with stats on each of 128 horses and 15 jockeys. Study the track condition and a horse's history and abilities, and then check the jockey and his mood as you try to pick a winner. If you're stuck for a choice, try buying a tip from one of several track characters.

The graphics in *Horse Racing* are especially impressive. They include a dual-scrolling background and track to give an impression of depth. To get the most out of a 64, Ringler didn't accept the machine's eight-sprite limit. That's evident when nine horses are on a track at one time. "There's some very, very careful management of sprite locations and interrupt-driven changes, and all kinds of fancy things going on," he says. "There's an awful lot of bitmapped animation. Even the sprites of the horse are handled with bitmapping technology. There's no way you could have those nine horses using just sprites. We're applying IBM- and Amiga-like technology to the 64."

In SportTime's Omni-Play series, every game is expandable through the addition of optional modules. A Stable Owner's package is *Horse Racing*'s first option module. With it you try to put together a stable of horses and build a career for yourself. You own the horses, you hire jockeys, and, based on their abilities and skill, you decide which races to enter.

The Jockey Competition module is arcadelike and should appeal to younger players. Here, you compete against 14 other jockeys in trying to gain experience and win races.

In a module called Track 3, you view the race from the jockey's perspective. Instead of watching the race from the stands, you're on the horse's back. "We've taken a lot of auto-racing concepts and put them into the world of horse racing," Ringler says. "Now you are the jockey. You're on the horse's back, and you are actually riding him, watching the railing flash by and deciding when to speed up, slow down, or to use the whip."

After spending more than two years developing *Horse Racing*, Ringler said he felt it was a shame to have it run into a dead end with an oval track. "We've got all these horses, all these graphics, all this code—why don't we have a more interesting track?" he asked.

To answer his own question, a new feature under development for the Track 3 module is a track-construction option. Instead of racing around an oval track, players can add scenery and race cross-country. There will be turns, intersections, trees, and obstacles normally found in a rural countryside. "You have pieces that you can rotate and place on a master board," Ringler says. "Then you can sample different sections of the course by running them in a 3-D perspective." As with any of the Omni-Play series, you can combine modules to add a whole new dimension to horse racing.

An admitted drawback to *Horse Racing* is the slow loading forced on it by the Commodore disk drives. Ringler himself recommends a fast loader of some kind. "Unfortunately, the longest horse race takes only two minutes and then the game moves into other sections, requiring another load," he says. There's a lot of data being loaded and processed. The 64 is so pushed with data for graphics, animation, and statistics that there simply is no room for a built-in fast-loading routine. Despite this, Ringler says he gets positive feedback about the program from 64 owners who don't have fast loaders. **G**

Designers Speak Out!

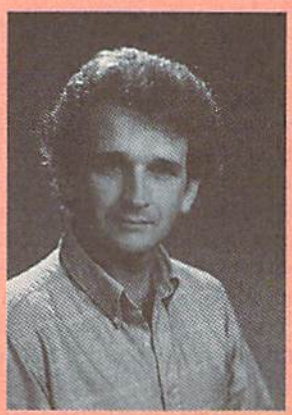
Data East's Dennis Thorley on the 64:

We've felt that the Commodore 64 user has been sadly neglected. Data East has a significant interest in the 64, and we are still bringing out major titles for it. A lot of other publishers have abandoned it, but our philosophy now is that we will continue to support the 64 with what we feel are good titles. We don't just shove out everything for the 64 that we get from Europe. We've had very good luck with *Batman* and *Batman—the Movie*. With *Monday Night Football*, sales figures have been very, very impressive. So we feel there's still a market out there and there's a way we can be financially successful supporting that market.

SportTime's Ed Ringler on substance in games:

We're not just making videogames, we're making sports simulations. When we get into a sport, accuracy and depth are very important to us. There's far too much flash in the industry and not enough substance. Graphics and sound are important, but computers are about simulations and having fun. If I wanted a great picture, I'd go out and buy a 35mm camera. We're spending thousands of dollars on computer equipment to approach the video quality of an 80-cent photograph. We need to focus on what a computer can do that's unique. Having it generate pretty pictures and sound is not enough.

Electronic Arts' Robin Antonick on concepts:



I believe it really comes down to the artist who does the product. There's at least as much machine in the 64 as there is in the Nintendo. What it really boils down to is the concept and execution. I'm hoping that we as a community of artists and programmers are becoming more mature and are better understanding the medium and the concept of interactivity. We still spend too much time in the bowels of the machine and not enough time working on the idea. There are some great concepts out there that we haven't discovered that can be done with the least powerful machine. When you think of the power of the 64 as an interactive tool compared to some other medium, such as the television, there's a tremendous amount that we can do with a Commodore 64.

COMPUTE!'s Gazette Author's Guide

Here are some suggestions which serve to improve the speed and accuracy of publication for prospective authors. *COMPUTE!'s Gazette* is primarily interested in new and timely articles on the Commodore 128 and 64. We are much more concerned with the content of an article than with its style, but articles should be as clear and well explained as possible.

The guidelines below will permit your good ideas and programs to be more easily edited and published.

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. If your article is specifically directed to one model of computer, please state the model name. In addition, *please indicate the memory requirements of programs.* The model name and memory requirements should appear in the upper right corner of the first page.

3. The underlined title of the article should be placed about ⅔ of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number—for example: Memory Map/ Smith/2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be divided at the ends of lines. And please do not right-justify. Leave the lines ragged.

6. Standard typing or computer paper should be used (no erasable, onionskin, or other thin paper), and typing should be on one side of the paper only (upper- and lowercase).

7. If you are submitting more than one article, send each one in a separate mailer with its own disk.

8. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on disk.* If your article was written with a word processor, we request that you include a copy of the text file on disk. If you include a copy of your article on disk, please save the article as plain text, without any special formatting characters or control codes. Most word processors provide an option for saving a document as plain ASCII text or in unformatted form. The disk should be labeled with your name and the title of the article. Disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores). If possible, programs written in machine language or a compiled language should include source code (or an annotated disassembly if the program was written with a machine language monitor).

9. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are Figure 5, Table 3, TAB(4), and so on. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: Use *and* (not &), *reference* (not *ref.*), *through* (not *thru*).

10. For greater clarity, use all capitals when referring to keys (RETURN, CTRL, SHIFT), BASIC words (LIST, RND, GOTO), and the language BASIC. Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word; then it will be italicized during typesetting.

11. Articles can be of any length—from a single-line routine to a multiple-issue series. The average article is about four to eight double-spaced, typed pages.

12. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

13. *COMPUTE!'s Gazette* pays between $200 and $1,200 for articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance. Following submission (to Editorial Department, *COMPUTE!'s Gazette*, P.O. Box 5406, Greensboro, North Carolina 27403), it will take from four to eight weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned to authors who enclose a self-addressed, stamped envelope.*

14. If your article is accepted and you subsequently make improvements to the program, please submit an entirely new disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing *Revision* on the envelope and the article.

15. *COMPUTE!'s Gazette* does not accept unsolicited product reviews. G

A Guide to Commodore User Groups

Part 1

Edited by Liz Casey

This annual *Gazette* feature provides an up-to-date list of user groups across the U.S., throughout Canada, and around the world. Part 1 includes states *A* through *M* (Alabama–Montana). Under each state heading, the groups are listed in order according to ZIP code.

User Groups from the remaining states (Nebraska–Wyoming), from APO sources, and from foreign countries will be listed next month.

If your group does not appear in this list, send your club name, address, and bulletin board service telephone number (if available) to

Commodore 64/128 User Group Update
COMPUTE!'s Gazette
P.O. Box 5406
Greensboro, NC 27403

Your group will be listed in "User Group Update" in a future issue.

Note: When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing. COMPUTE! Publications does not condone the use of its user group lists by individuals or user groups for the purpose of buying, selling, or trading pirated software. Should we discover any group participating in any such illegal and unethical activity, the club's listing will be permanently deleted from our files.

ALABAMA

Valley Commodore Users Group (VCUG), P.O. Box 835, Decatur, AL 35602-0835

Scottsboro Commodore Users Group, Rt. 5 Box 255, Scottsboro, AL 35768

Coosa Valley Commodore Club (CVCC), P.O. Box 1893, Gadsden, AL 35902-1893

Amiga/Commodore Club of Mobile, 3868-H Rue Maison, Mobile, AL 36608

Commodore Mobile Users Group (CMUG), P.O. Box 9524, Mobile, AL 36691-0524

ALASKA

Anchorage Commodore Users Group (ACUG), Box 104615, Anchorage, AK 99510 (BBS# 907-349-7467)

Sitka Commodore User's Group, P.O. Box 2204, Sitka, AK 99835

ARIZONA

Arizona Commodore Enthusiasts (ACE), P.O. Box 46227, Phoenix, AZ 85063

Arizona Commodore Users Group, P.O. Box 27201, Tempe, AZ 85282

Gila Hackers, Rt. 1 Box 34, Globe, AZ 85501

Catalina Commodore Computer Club, P.O. Box 32548, Tucson, AZ 85751-2548 (BBS# 602-790-6751)

Prescott Area Commodore Club (PACC), P.O. Box 4019, Prescott, AZ 86301

ARKANSAS

IBM-Commodore-Amiga (ICOM) Network, 1821 Breckenridge Dr., Little Rock, AR 72207

Triple-D 64, P.O. Box 301, Reyno, AR 72462

The Personal Touch C.U.G., c/o 503 Kaylynn Dr., Walnut Ridge, AR 72476 (BBS# 501-886-1701)

CALIFORNIA

Orange County Commodore Club (OCCC), 7950 Puritan St., Downey, CA 90242

South Bay Commodore User's Group, 15904 S. Vermont Ave., Gardena, CA 90247 (BBS# 213-545-8653)

Commodore 64 West User Group, 2306 W. 180 St., Torrance, CA 90504

Southern California Commodore Users Group, 11018 E. Rosecrans Ave., Suite 203, Norwalk, CA 90650 (BBS# 213-864-2105)

Commodore Helpers of Long Beach, 3736 Myrtle Ave., Long Beach, CA 90807

California Area Commodore Terminal User Society (CACTUS), P.O. Box 1277, Alta Loma, CA 91701

Association for Sharing Commodore Information (ASCI), 6160 Malvern Ave., Rancho Cucamonga, CA 91701-3736

C128 West Commodore 128 User Group, c/o John P. Calhoun, 17047 Devanah St., Covina, CA 91722 (BBS# 714-598-1755)

▷

Commodore User Groups, Part 1

Temple City Commodore Users Group (TCCUG), 9317 E. Olive St., Temple City, CA 91780

East County Commodore Users Group, P.O. Box 21399, El Cajon, CA 92021

Oceana-64 Commodore User Group, 1004 Plover Way, Oceanside, CA 92056

General Dynamics CRA Commodore Computer Club, General Dynamics Electronics, MZ-7234A, P.O. Box 85310, San Diego, CA 92138-5310

Club-64 (San Bernardino), P.O. Box 514, Patton, CA 92369

Victor Valley Commodore Interest Association (VVCIA), P.O. Box 385, Victorville, CA 92393-0241

Commodore Users Group of Riverside (CUGR), P.O. Box 8085, Riverside, CA 92515

Coast Commodore Club (CCC), P.O. Box 1497, Costa Mesa, CA 92628 (BBS# 714-979-8333)

Commodore Technical User Group (CTUG), P.O. Box 1497, Costa Mesa, CA 92628

Power Surge, c/o Orangewood Academy, 13732 Clinton Ave., Garden Grove, CA 92643

Coastline Commodore Club, 20311 Ravenwood Ln., Huntington Beach, CA 92646

South Orange Commodore Klub (SOCK), 25401 Champlain Rd., Laguna Hills, CA 92653

Ventura Commodore Club, 123 Howard St., Ventura, CA 93003

Commodore Computer Club, 55 Beverly Dr., Camarillo, CA 93010

CIVIC64/128, P.O. Box 2442, Oxnard, CA 93034-2442

A Bakersfield Area Commodore Users Society (ABACUS), P.O. Box 40334, Bakersfield, CA 93384 (BBS# 805-324-8217)

Simply Users of Computers Combining Experience for Strength and Success (SUCCESS), 64 Almond Crest Ct., Paso Robles, CA 93446 (BBS# 805-238-7359)

Central Coast Commodore Users Group, 4237 Plumeria Ct., Santa Maria, CA 93455 (BBS# 805-934-2216)

Fresno Commodore User Group/64UM, P.O. Box 16098, Fresno, CA 93755 (BBS# 209-226-5313)

PLUG (Plus/4 Users' Group), P.O. Box 1001, Monterey, CA 93942

PETCETERA-on-the-Air, 525 Crestlake Dr., San Francisco, CA 94132

North Bay User's Group (NBUG), P.O. Box 7156, Vallejo, CA 94590 (BBS# 415-643-6284)

64/More Commodore User Group, P.O. Box 26811, San Jose, CA 95159-6811

Valley Computer Club, P.O. Box 310, Denair, CA 95316

Sacramento Commodore Computer Club, P.O. Box 13393, Sacramento, CA 95813-3393

Marysville-Yuba City Hub Area Commodore Club (HACC), 7127 Arrowhead Tr., Browns Valley, CA 95918-9630 (BBS# 916-674-1703)

North Valley Commodore Users Group (NVCUG), P.O. Box 7658, Chico, CA 95927

Hub Area Commodore Club (HACC), 743 Jewell Ave., Smartsville, CA 95977 (BBS# 916-674-1703)

Commodore Owners Users Group of Redding (COUGOR), 1012 Layton Rd. #20, Redding, CA 96002

Redding Commodore User Group, P.O. Box 493762, Redding, CA 96049

The Classic 64 Preservation Society, 660 Walton Dr., Red Bluff, CA 96080 (BBS# 916-527-0975)

Elf Brigade Swipe Swap, P.O. Box 173, Red Bluff, CA 96080 (BBS# 916-527-0975)

COLORADO

Colorado Commodore Computer Club, 1192 S. Nome St., Aurora, CO 80012 (BBS# 303-341-1427)

Colorado Plus Four Forum, 1340 Fillmore St., Denver, CO 80206

Ft. Collins C3, P.O. Box 2051, Ft. Collins, CO 80522

Front Range Commodore Club, P.O. Box 272, Niwot, CO 80544-0272

Western Slope Commodore Users Group, 3125-B Lakeside Dr., Grand Junction, CO 81506

CONNECTICUT

Capital Region Commodore Computer Club (CRCCC), P.O. Box 2372, Vernon, CT 06066

Hartford County Commodore Users Group, P.O. Box 8553, East Hartford, CT 06108

Eastern Conn. Commodore Users Group, P.O. Box 136, Hebron, CT 06248 (BBS# 203-228-1031)

The New London County Commodore User's Group (NLCCUG), P.O. Box 697, Groton, CT 06340 (BBS# 203-848-1986)

Computer Users Group, 6 Saner Rd., Marlborough, CT 06447

The Naugatuck Valley Commodore Users Group, P.O. Box 622, Waterbury, CT 06720

Stamford Area Commodore Society (SACS), P.O. Box 2122, Stamford, CT 06906-0122

DELAWARE

First State Commodore Club, P.O. Box 1313, Dover, DE 19903

The Commodore U.S.A. Club, Rt. 2 Box 329, Delmar, DE 19940

Wicomico Commodore Users Group, 913 Grove St., Delmar, DE 19940

FLORIDA

Port Orange Commodore User Group (POCUG), 1244 Thomasina Dr., Port Orange, FL 32019

Public Domain Users Group, P.O. Box 1442, Orange Park, FL 32067

Welaka Commodore Users Group, P.O. Box 1104, Welaka, FL 32093-1104

Commodore Computer Club of Jacksonville, 6956 Mauldin Ln., Jacksonville, FL 32244

Dinosaur 64, c/o Robbin Tate, Madison, FL 32340-5118

Commodore User Group of Pensacola, P.O. Box 36367, Pensacola, FL 32516 (BBS# 904-456-8205)

Commodore Milton User Group (CMUG), P.O. Box 225, Milton, FL 32572

Gainesville Commodore User Group, P.O. Box 14716, Gainesville, FL 32604-4716

Titusville Commodore Club, 890 Alford St., Titusville, FL 32796 (BBS# 407-269-2169)

Central Florida Commodore Users' Club, P.O. Box 547326, Orlando, FL 32854-7326

Video Juegos de Costa Rica, P.O. Box 149010, Coral Cables, FL 33114-9010

Miami Individuals with Commodore Equipment (MICE), 11110 Bird Rd., Miami, FL 33165 (BBS# 305-253-1494)

Tampa Commodore User's Group, P.O. Box 260973, Tampa, FL 33685-0973

Charlotte County Commodore Club (CCCC), P.O. Box 512103, Punta Gorda, FL 33951-2103

Bits and Bytes Computer Club, 1859 Neptune Dr., Englewood, FL 34223

Mana Sota Commodore Users Group (MSCUG), P.O. Box 698, Oneco, FL 34264-0698 (BBS# 813-748-7513)

Ram-Rom 84 Commodore Users Group, P.O. Box 3880, Venice, FL 34293-3880 (BBS# 813-484-9139)

Commodore Brooksville User Group (C-BUG), P.O. Box 1261, Brooksville, FL 34605

Clearwater Commodore Club, P.O. Box 11211, Clearwater, FL 34616

Gulfcoast 64's Commodore Users Group, P.O. Box 11180, Clearwater, FL 34616 (BBS# 813-584-6040)

Suncoast Commodore Club, P.O. Box 6628, Ozona, FL 34660-6628

Lake/Sumter Commodore Users Group, P.O. Box 416, Leesburg, FL 34749

Starcom User's Group Martin County, P.O. Box 1446, Port Salerno, FL 34992

GEORGIA

Metro Atlanta Commodore Klub (MACK), P.O. Box 813481, Smyrna, GA 30081 (BBS# 404-590-7114)

Stone Mountain Users Group (SMUG 64/128), P.O. Box 1762, Lilburn, GA 30226 (BBS# 404-925-8829)

Commodore Format User's Group, P.O. Box 91541, East Point, GA 30364 (BBS# 404-768-1908)

Athens Commodore Users Group, One Beech Haven, Athens, GA 30606

Commodore Users Group of Columbus, Georgia, 960-B Michael St., Columbus, GA 31905-5122 (BBS# 404-568-1632)

HAWAII

Commodore Hawaii Users Group (CHUG), P.O. Box 23260, Honolulu, HI 96822 (BBS# 808-672-6483)

IDAHO

Pocatello Commodore Users Group (PCUG), Rt. 2 Box 48E, Pocatello, ID 83202 (BBS# 208-237-6935)

PFP 64 Software Exchange, 742 E. 19th, Jerome, ID 83338

Banana Belt Commodore Users Group (BBCUG), P.O. Box 1272, Lewiston, ID 83501

GEM-64, Ken Rosecrans, 407 N. DeClark, Emmett, ID 83617

Commodore Treasure Valley/Boise Users Group (TV/BUG), P.O. Box 6853, Boise, ID 83707

ILLINOIS

United Northern Computer Learning Exchange (UNCLE), 533 N. 4th Ave., Des Plaines, IL 60016 (BBS# 312-338-6500)

Great Lakes Commodore Club, P.O. Box 322, Lake Bluff, IL 60044

Computers West, P.O. Box 3357, Glen Ellyn, IL 60138-3357

SouthWest Regional Association of Programmers/64 Users Group (SWRAP), P.O. Box 342, Bedford Park, IL 60499-0342

CCR Commodore Club, P.O. Box 10022, Rockford, IL 61131-0024

Knox Commodore Club, P.O. Box 494, Galesburg, IL 61402-0494 (BBS# 309-344-5042)

Canton Area Commodore Users Group, P.O. Box 61, Canton, IL 61520

Meeting 64/128 Users Thru the Mail, R.R. 1 Box 151, St. Joseph, IL 61873

Champaign-Urbana Commodore User Group (CUCUG), 802 N. Parke St., Tuscola, IL 61935 (BBS# 217-356-8056)
The Trading Inn, 1525 Andrews, Cahokia, IL 62206-2402 (BBS# 618-337-1664)
Gateway Computer Club, P.O. Box 1839, Fairview Heights, IL 62208
Western Illinois Programmer's User Group (WIPUG), Rt. 5 Box 75, Quincy, IL 62301-9314
Lincoln Area Commodore Users Group, P.O. Box 131, Lincoln, IL 62656

INDIANA

Indianapolis Computer Club, P.O. Box 11367, Indianapolis, IN 46201 (BBS# 317-297-1661)
Kosciusko Commodore User's Group, 312 E. Prairie, Warsaw, IN 46580
Logansport Commodore Club, P.O. Box 1161, Logansport, IN 46947
Rochester Commodore Computer Club, 428 Clay St., Rochester, IN 46975 (BBS# 219-223-8107)
Com-Net, P.O. Box 161, Vevay, IN 47043
QS! Alliance, 5846 Hwy. 111 S, New Albany, IN 47150
Richmond Area Computer Users Group (RACUG), P.O. Box 1332, Richmond, IN 47375 (BBS# 317-935-1256)
Commodore Computer Club, 819 Treelane Dr., Newburgh, IN 47630
Fraternal Order of Police Computer Club (FOPCC), 2535 Anthony Dr., Evansville, IN 47711

IOWA

Commodore Users Group Ames Region (COUGAR), P.O. Box 2302, Ames, IA 50010-2302 (BBS# 515-292-6204)
Capitol Complex Commodore Computer Club, P.O. Box 212, Des Moines, IA 50301
Commodore Computer User's Group of Iowa (CCUGI), P.O. Box 3140, Des Moines, IA 50316
Ft. Dodge Commodore Users Group, P.O. Box 63, Moorland, IA 50566
3C Users Group, R.R. 3 Box 20, Charles City, IA 50616
Product Engineering Center Commodore Users Group (PECCUG), 319 Ivanhoe Rd., Waterloo, IA 50701
Plymouth County Commodore User's Group (PLYCCUG), 508 1st St. SW, Le Mars, IA 51031
Crawford County Commodore Users Group, 519 N. 19th St., Denison, IA 51442
Commodore Players & Users of Iowa, P.O. Box 493, Essex, IA 51638
Commo-Hawk Commodore Users Group, P.O. Box 2724, Cedar Rapids, IA 52406-2724 (BBS# 319-377-4095)

KANSAS

TCCUG, P.O. Box 8439, Topeka, KS 66608
Newton Area User Group, 112 Brookside, Newton, KS 67114 (BBS# 316-283-9141)
High Plains Commodore Users Group, 1307 Western Plains, Hays, KS 67601 (BBS# 913-628-6611)

KENTUCKY

Louisville Users of Commodore of Kentucky (LUCKY), P.O. Box 19032, Louisville, KY 40219-0032 (BBS# 502-969-9360)
Commodore User's Club of Jenkins, c/o Jenkins High School, Patricia Johnson, Box 552, Jenkins, KY 41537
Bowling Green Commodore Users Group, c/o Bill Edwards, President, 1052 Castle Heights Rd., Bowling Green, KY 42103
Glasgow Commodore Computer Club, P.O. Box 154, Glasgow, KY 42141 (BBS# 502-678-5292)
Commodore Owners of Owensboro, KY (COOKY), 3807 Krystal Ln., Owensboro, KY 42303 (BBS# 502-684-0422 and 502-683-3533)
Muhlenberg County Commodore Users Group (MCCUG), P.O. Box 12, Greenville, KY 42345

LOUISIANA

New Orleans Commodore Klub, 3701 Division St., Suite 140, Metairie, LA 70002
West Bank Users Group, P.O. Box 740854, New Orleans, LA 70174-0854
Baton Rouge Area Commodore Enthusiasts (BRACE), P.O. Box 1422, Baton Rouge, LA 70821 (BBS# 504 387-6613)
PAGE U.G., P.O. Box 7703, Alexandria, LA 71306-7703

MAINE

Commodore Users Group of Coastal Maine, R.R. 2 Box 3254, Bowdoinham, ME 04008
Your Users Group (YUG), P.O. Box 1924, N. Windham, ME 04062
Southern Maine Commodore User Group, P.O. Box 416, Scarborough, ME 04074-0416 (BBS# 207-967-3719)
Commodore Users Society of Penobscot (CUSP), c/o 101 Crosby Hall, University of Maine at Orono, Orono, ME 04469
Island/Reach Computer Users Group, P.O. Box 73, Deer Isle, ME 04627 (BBS# 207-374-2303)

MARYLAND

FOCUS DC/MD/VA, P.O. Box 153, Annapolis Junction, MD 20701
Laurel-Bowie User Group (L-BUG), P.O. Box 924, Bowie, MD 20715-0924
Rockville Commodore Users Group, P.O. Box 8805, Rockville, MD 20856
National Bureau of Standards Commodore Users Group, 8 Cross Ridge Ct., Germantown, MD 20874
Gaithersburg Commodore Users Group, P.O. Box 2033, Gaithersburg, MD 20879
Capital COMAL User Group, 10200 Leslie St., Silver Spring, MD 20902
VIC Appreciators (VICAP), 10260 New Hampshire Ave., Silver Spring, MD 20903
BAYCUG, 110 Danbury Rd., Reisterstown, MD 21136
North Baltimore Users Group (NOBUG 64/128), P.O. Box 18835, Baltimore, MD 21206
Westinghouse Commodore Users Group, P.O. Box 8756, Baltimore, MD 21240
Annapolis Commodore User's Group, P.O. Box 3358, Annapolis, MD 21403
Hagerstown User Group (HUG), 953 W. Washington St., Hagerstown, MD 21740

MASSACHUSETTS

Pioneer Valley Computer Club, 6 Laurel Terr., Westfield, MA 01085 (BBS# 413-568-4466)
Commodore User Group of the Berkshires, 159 Doreen St., Pittsfield, MA 01201
Commodore Users Group of Cape Cod, 149 Hayway Rd., East Falmouth, MA 02536 (BBS# 508-888-8769 and 508-457-4900)
Fall River Commodore's Club, 117 Lewin St., Fall River, MA 02720 (BBS# 508-677-4535)

MICHIGAN

Michigan Commodore Users Group, P.O. Box 539, East Detroit, MI 48021 (BBS# 313-293-7340 and 313-892-3375)
Computer Owners of Marysville, Port Huron, 2937 W. Woodland Dr., Port Huron, MI 48060
Washtenaw Commodore Users Group, P.O. Box 2050, Ann Arbor, MI 48106-2050 (BBS# 313-971-2714)
Downriver Commodore Group, P.O. Box 1277, Southgate, MI 48195
Sterling Heights Commodore Club (SHCC), 5027 Amherst, Sterling Heights, MI 48301
Saginaw Area Commodore User's Group (SACUG), P.O. Box 2393, Saginaw, MI 48605
Midland Computer Club, 4702 Jefferson, Midland, MI 48640
Bay Area Commodore Club, 338 S. Sheridan Ct., Bay City, MI 48708
Battle Creek Commodore and Amiga V. Enthusiasts (BCCAVE), 1299 S. 24th, Battle Creek, MI 49015
Tri-County Computer Club, 607 E. Dowland St., Ludington, MI 49431
West Michigan Commodore Users Group, P.O. Box 88191, Kentwood, MI 49508

MINNESOTA

Minnesota Commodore Users Association, P.O. Box 22638, Robbinsdale, MN 55422 (BBS# 612-535-7018)
Redwood Falls Area Computer Exchange, 717 E. Wyoming St., Redwood Falls, MN 56283
Commodore Bemidji User Group, 4740 Sunnyside Rd. SE, Bemidji, MN 56601-8313

MISSISSIPPI

Coastline Commodore Computer Club, P.O. Box 114, Biloxi, MS 39533 (BBS# 601-374-2582)

MISSOURI

McDonnell Douglas Commodore Users Group, c/o Bruce Darrough, 28 Redwood, Florissant, MO 63031 (BBS# 314-837-0413)
Commodore Users Group of St. Louis, P.O. Box 28424, St. Louis, MO 63146-0984 (BBS# 314-878-4035)
Northeast Missouri Commodore Users Group (NEMOCUG), P.O. Box 563, Macon, MO 63552
Heartland Users Group, P.O. Box 281, Cape Girardeau, MO 63702-0281
Commodore Users Group of Kansas City, P.O. Box 36034, Kansas City, MO 64111 (BBS# 816-353-9961)
Commodore North Users Group, P.O. Box 34534, N. Kansas City, MO 64116 (BBS# 816-455-0122)
Barton County Computer Users Group (BCCUG), 611 W. 10th, Lamar, MO 64759
Joplin Commodore Computer User Group, 422 S. Florida Ave., Joplin, MO 64801
Mid-Missouri Commodore Club, 222 Elliot, Columbia, MO 65201 (BBS# 314-442-0477)
Columbia Commodore User (CCU), P.O. Box 7633, Columbia, MO 65205 (BBS# 314-449-8095 and 314-642-2130 Nights and Weekends)
MOARK (Missouri/Arkansas) Commodore Users Group, H.C. Rt. 1 Box 85, Lampe, MO 65681
Commodore User Group of Springfield (CUGOS), Box 607, Springfield, MO 65801 (BBS# 417-862-9325)

MONTANA

Commodore Classic User Group, P.O. Box 3454, Great Falls, MT 59403

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VDC MONITOR PLUS

Douglas Doole

Examine and modify 80-column video memory without going through the control registers with this machine language monitor enhancement for the 128.

One of the most powerful features of the 128 is its built-in machine language monitor. It offers an excellent selection of commands for working within the 128's many memory banks, but one important bank is ignored. This overlooked bank of memory is normally used by the VDC, the 128's 80-column video chip. To access this memory, you normally have to go through the control registers at $D600 and $D601 (54784 and 54785). Now *VDC Monitor Plus* adds commands to the 128's built-in monitor that allow you to manipulate the VDC's registers and RAM directly.

Getting Started

VDC Monitor Plus consists of two programs. The first program, VDC Monitor+, is written entirely in machine language. The second program, Relocator, is a BASIC loader utility that allows you to change *Monitor Plus*'s location in memory.

To enter *Monitor Plus*, you'll need to use *128 MLX*, the machine language entry program located elsewhere in this issue. The *MLX* prompts, and the values you should enter, are as follows:

Starting address: 1300
Ending address: 16B7

When you've finished typing in the data for *Monitor Plus*, be sure to save a copy of the program to disk.

To prevent typing errors, enter Relocator using *The Automatic Proofreader*, also located elsewhere in this issue. Again, when you've finished typing, save the program to disk.

To use *VDC Monitor Plus*, simply load it with the command LOAD"VDC MONITOR+",8,1 and then type SYS 4864. You won't notice any change in the 128's behavior until you enter the monitor. To deactivate *Monitor Plus*, you must reset the 128.

Seven New Commands

VDC Monitor Plus adds seven commands to the monitor. Four of them allow you to access the VDC chip, and the other three are more general-purpose commands.

In the following command descriptions, the commands themselves and constant parameters are shown in bold type while variable parameters are shown in bold italic type. Optional parameters are indicated by parentheses, and repeating parameters are represented by ellipses.

***** Displays the contents of the 37 VDC registers. Each register number is shown followed by the contents of the register. Commas separate adjacent registers. An example, shown on the 40-column screen, might look like the following:

```
'00 7E,  01 50,  02 66,  03 49
'04 20,  05 E0,  06 19,  07 1D
'08 FC,  09 E7,  0A A0,  0B E7
'0C 00,  0D 00,  0E 02,  0F 30
'10 1C,  11 06,  12 0A,  13 32
'14 08,  15 00,  16 78,  17 E8
'18 20,  19 47,  1A F0,  1B 00
'1C 2F,  1D E7,  1E 4F,  1F 07
'20 07,  21 D0,  22 7D,  23 64
'24 F5
```

'*register value* (,*register value*)... Sets one or more VDC registers to a given value. The first parameter is the register to change; the second is the value to store in the register. You can enter up to 16 register/value pairs with one ' command. For example, the following sets up an 80 × 50 screen.

```
'08 03, 04 40, 06 32, 07 3A, 00 80
```

If you use the ' command to change register $12 (18) or $13 (19), the values will be lost when something is printed to the 80-column screen. To avoid this problem, work on the 40-column screen when setting these registers or make all of the changes using one ' command. For example, to fill VDC memory with 0s from $0500 to $0550 (1280 to 1360), you'd have to type

```
'18 20, 12 05, 13 00, 1F 00, 1E 50
```

Also, when register $1E (30) is changed, characters may appear on the screen briefly as the VDC chip does a memory copy or fill.

/(*startaddress* (*endaddress*)) Displays the contents of VDC memory in hexadecimal and ASCII. The / command behaves exactly like the monitor's M command. For example, to examine VDC memory from 0000 to 0010, you'd type /0000 0010 and the following output would appear:

```
]0000  31 30 20 04 05 06 06 0E:10 .....
]0008  08 02 28 18 29 3D 09 0E:..(.)=..
]0010  14 28 18 2F 32 35 36 29:.(./256)
```

]*address byte* (*byte*)... Changes VDC memory. This command behaves like the monitor's > command. To use it, type] followed by the starting address and then enter the values to place in memory, separated by spaces. All addresses and values must be in hex.

Note that the / command places a] in front of each line it displays. This allows you move the cursor over a byte that you want to change, type in the new value, and then enter it by pressing RETURN.

↑ Toggles Fast mode. This command toggles the 128's microprocessor between the fast and slow modes.

P(*filenumber* (,*devicenumber* (,*secondaryaddress*))) Toggles the printer on and off. When the printer is turned on, everything shown on the screen will be echoed to the printer. When it is turned off, the monitor behaves normally.

You can specify values for the file number, the device number, and the secondary address when you turn the printer on. If you turn it on by entering the P command by itself, the default values of 4, 4, and 0 will be used. If the printer is already on, any form of the P command turns it off.

←(*startaddress* (*number of instructions*)) Performs a threading disassembly. You can specify the address to start disassembling from and how many instructions to disassemble. If you enter the ← command by itself, the program disassembles ten instructions beginning from the current program counter. If you specify only the starting address, the program disassembles ten instructions starting at the specified address.

The ← command behaves like the monitor's d command until it reaches a JMP, a JSR, or an RTS instruction. Upon encountering one of these instructions, the disassembler follows the program logic. An example of a threading disassembly might look like this:

```
←04000 0B
.04000  A9 16     LDA  #$16
.04002  8D 19 03  STA  $0319
.04005  60        RTS
:-------------------------------------
.04006  20 1B 42  JSR  $421B
:-------------------------------------
.0421B  A5 A8     LDA  $A8
.0421D  C9 40     CMP  #$40
.0421F  60        RTS
:-------------------------------------
.04009  D0 12     BNE  $401D
.0400B  4C F4 40  JMP  $40F4
:=====================
.040F4  A9 00     LDA  #$00
.040F6  85 60     STA  $60
```

In this case, the command disassembled 11 instructions starting at location $4000 (16384) in bank 0. Notice that the first RTS (at location $04005) doesn't cause the disassembler to branch to a new location. This is because the disassembler hasn't processed a JSR yet and therefore doesn't know where to branch.

The threading disassembler can go into an endless loop in certain situations. For example, in the following program fragment, the disassembler becomes caught in the loop that begins at $0B00 (2816).

```
0B00  INY
0B01  CPY #$10
0B03  BEQ $0B08
0B05  JMP $0B00
0B08  program continues...
```

To continue disassembling code like this, you'll have to jump out of the loop manually by beginning the disassembly after the loop (at $0B08).

Relocating the Program

VDC Monitor Plus was specifically designed to be compatible with other machine language programs. Unfortunately, the area of memory where it resides, beginning at $1300 (4864), is used by many other ML programs. Relocater is designed to help solve this problem by allowing you to move *Monitor Plus* to any location within bank 15.

To move *Monitor Plus*, simply load and run Relocator. It prompts you for the address where *Monitor Plus* should start. Enter the value in either decimal or hexadecimal. (Hexadecimal addresses should be preceded by $.) Next, the program asks for the filename of the current version of *Monitor Plus*. Type the filename and press RETURN.

Relocator loads *Monitor Plus*, makes the necessary adjustments in it and then asks if you want to save a copy of the new version to disk. Reply by pressing Y or N. If you decide to save the program, you must enter the filename for the new version. Whether you save the new version or not, Relocator activates *Monitor Plus* before exiting to BASIC.

How It Works

To add the new commands to the monitor, *VDC Monitor Plus* wedges itself into the IEXMON vector at $032E (814). It also wedges into the IBSOUT vector at $0326 (806) to allow it to echo characters to the printer. To keep itself active after RUN/STOP-RESTORE has been pressed, *Monitor Plus* wedges itself into the INMI vector at $318 (792).

Monitor Plus should work in conjunction with other monitor enhancements such as *ML Enhancer* from the June 1989 *Gazette* as long as *Monitor Plus* is the last program activated. To determine whether a specific monitor enhancement will work with *Monitor Plus*, you'll simply have to try the two together.

To minimize conflict with other programs, *Monitor Plus* uses only the memory locations that are normally used by the built-in monitor. The one exception to this is caused by the threading disassembler. The threading disassembler uses BASIC's stack to store the addresses of the JSRs it encounters. But this won't interfere with BASIC unless you issue a CONT command after using *Monitor Plus*'s ← command.

VDC Monitor+

```
1300:AD 2E 03 8D 65 13 AD 2F C3
1308:03 8D 66 13 A9 33 8D 2E 74
1310:03 A9 13 8D 2F 03 AD 26 64
1318:03 8D 44 16 8D 54 16 AD A4
1320:27 03 8D 45 16 8D 55 16 48
1328:A9 56 8D 18 03 A9 16 8D 64
1330:19 03 60 C9 27 D0 03 4C 1B
1338:67 13 C9 2A D0 03 4C 8D 6B
1340:13 C9 5D D0 03 4C C4 13 01
1348:C9 2F D0 03 4C F7 13 C9 9B
1350:5E D0 03 4C AC 14 C9 5F A7
1358:D0 03 4C BF 14 C9 50 D0 66
1360:03 4C B5 15 4C FF FF 20 A5
1368:A7 B7 B0 1E A5 60 C9 25 AF
1370:90 03 4C BC B0 20 01 B9 B6
1378:20 A7 B7 90 03 4C BC B0 0C
1380:A5 60 A6 66 20 CC CD 4C E8
1388:67 13 4C 8B B0 A2 00 20 99
1390:B4 B8 A9 27 20 D2 FF A0 D3
1398:04 A5 D7 10 02 A0 08 8A 53
13A0:20 A5 B8 20 DA CD 20 C2 6A
13A8:B8 E8 E0 25 F0 13 88 D0 89
13B0:06 20 B4 B8 4C 92 13 20 F6
13B8:7D FF 2C 20 20 00 4C 9F 5E
13C0:13 4C 8B B0 20 A7 B7 B0 BF
13C8:25 20 01 B9 A2 13 A5 66 58
13D0:20 CC CD CA A5 67 20 CC 78
13D8:CD A0 08 A5 D7 10 02 A0 0D
13E0:10 20 A7 B7 B0 08 A5 60 D8
13E8:20 CA CD 88 D0 F3 20 AD 58
13F0:B8 20 49 14 4C 8B B0 A9 81
13F8:0B 85 63 A9 00 85 64 85 71
1400:65 20 A7 B7 B0 30 20 01 DA
1408:B9 20 A7 B7 B0 28 38 A5 C1
1410:60 E5 66 85 63 A5 61 E5 61
1418:67 85 64 05 63 B0 03 4C 62
1420:BC B0 46 64 66 63 46 64 93
1428:66 63 46 64 66 63 A5 D7 4F
1430:10 04 46 64 66 63 20 B4 26
1438:B8 20 49 14 20 E1 FF F0 A8
1440:05 20 3C B9 B0 F0 4C 8B 83
1448:B0 20 60 B9 A2 13 A5 66 8B
1450:20 CC CD CA A5 67 20 CC F9
1458:CD A0 09 A5 D7 10 02 A0 AE
1460:11 84 62 C6 62 20 D8 CD FD
1468:99 9A 16 88 D0 F7 20 50 46
1470:B9 A9 5D 20 D2 FF A5 66 D5
1478:A6 67 20 9F B8 A4 62 B9 A2
1480:9A 16 20 A5 B8 20 50 B9 7A
1488:88 D0 F4 20 7D FF 14 3A 18
1490:12 00 A4 62 B9 9A 16 C9 AA
1498:20 90 08 C9 80 90 06 C9 AE
14A0:A0 B0 02 A9 2E 20 D2 FF B7
14A8:88 D0 E9 60 AD 30 D0 49 A5
14B0:01 8D 30 D0 AD 11 D0 49 6C
14B8:10 8D 11 D0 4C 8B B0 20 8D
14C0:A7 B7 B0 0D 20 01 B9 A9 B3
14C8:00 8D B0 16 20 A7 B7 90 6B
14D0:0A A9 00 85 61 85 62 A9 50
14D8:0A 85 60 20 22 B9 20 7D 2B
14E0:FF 0D 1B 51 00 20 E1 FF 09
14E8:F0 24 20 D4 B5 20 1A B1 F7
14F0:C9 4C F0 1D C9 6C F0 2B 0E
14F8:C9 60 F0 50 C9 20 F0 69 5B
1500:EE AB 0A AD AB 0A 20 52 C0
1508:B9 20 22 B9 B0 D0 4C 8B E3
1510:B0 A0 01 20 1A B1 48 C8 CD
1518:20 1A B1 85 67 68 85 66 B5
1520:4C 9E 15 A0 01 20 1A B1 33
1528:48 C8 20 1A B1 85 67 68 29
1530:85 66 A0 00 20 1A B1 48 DF
1538:A5 66 C9 FF D0 02 C6 67 8B
1540:C8 20 1A B1 85 67 68 85 55
1548:66 4C 9E 15 AC B0 16 F0 23
1550:12 88 B9 00 08 85 67 88 8A
1558:B9 00 08 85 66 8C B0 16 95
1560:4C 9B 15 20 50 B9 4C 9B D9
```

VDC Monitor Plus

```
1568:15 A5 66 48 A5 67 48 A9 DC
1570:03 20 52 B9 AC B0 16 A5 04
1578:66 99 00 08 C8 A5 67 99 02
1580:00 08 C8 8C B0 16 68 85 C2
1588:67 68 85 66 A0 01 20 1A FA
1590:B1 48 C8 20 1A B1 85 67 CA
1598:68 85 66 A9 2D 2C A9 3D 6A
15A0:48 20 7D FF 0D 1B 51 3A 58
15A8:00 68 A0 1D 20 D2 FF 88 A7
15B0:D0 FA 4C 09 15 AD AC 16 EA
15B8:F0 1B CE AC 16 20 CC FF 91
15C0:AD AD 16 20 C3 FF AD 54 BF
15C8:16 8D 26 03 AD 55 16 8D D2
15D0:27 03 4C 8B B0 A9 04 8D 53
15D8:AD 16 8D AE 16 A9 00 8D E0
15E0:AF 16 EE AC 16 20 A7 B7 49
15E8:B0 19 A5 60 8D AD 16 20 DB
15F0:A7 B7 B0 0F A5 60 8D AE 5C
15F8:16 20 A7 B7 B0 05 A5 60 EB
1600:8D AF 16 AD AD 16 AE AE 4E
1608:16 AC AF 16 20 BA FF A9 57
1610:00 20 BD FF 20 C0 FF 90 90
1618:03 4C BC B0 A9 29 8D 26 AE
1620:03 A9 16 8D 27 03 4C 8B 3D
1628:B0 48 8A 48 98 48 A5 9A 60
1630:C9 03 D0 1A A5 99 D0 16 09
1638:AE AD 16 20 C9 FF 68 A8 B3
1640:68 AA 68 20 FF FF 48 8A 75
1648:48 98 48 20 CC FF 68 A8 A9
1650:68 AA 68 4C FF FF D8 A9 88
1658:7F 8D 0D DD AC 0D DD 30 AC
1660:36 20 36 F6 20 E1 FF D0 3F
1668:2E 20 56 E0 A9 33 8D 2E EF
1670:03 A9 13 8D 2F 03 A9 56 F2
1678:8D 18 03 A9 16 8D 19 03 88
1680:AD AC 16 F0 09 CE AC 16 73
1688:AD AD 16 20 C3 FF 20 09 23
1690:E1 20 00 C0 6C 00 0A 4C 85
1698:5F FA 00 00 00 00 00 00 33
16A0:00 00 00 00 00 00 00 00 CC
16A8:00 00 00 00 00 00 00 00 D4
16B0:00 00 00 00 00 00 00 00 DC
```

Relocator

```
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      ED
XX 20 DEFFNHB(X)=INT(X/256):DE
      FFNLB(X)=X-FNHB(X)*256
GB 30 PRINT"{CLR}":IFRGR(1)=5T
      HENWINDOW20,0,59,24
HQ 40 PRINTCHR$(14)"{4 DOWN}"S
      PC(9)"VDC MONITOR+ RELOC
      ATOR":PRINT
KJ 50 PRINT"WHAT ADDRESS SHOUL
      D VDC MONITOR+ BE":PRINT
      "INSTALLED AT";:INPUTAD$
      :PRINT
DD 60 IFINSTR(AD$,"$")THENAD=D
      EC(RIGHT$(AD$,LEN(AD$)-I
      NSTR(AD$,"$"))):ELSEAD=V
      AL(AD$)
JH 70 INPUT"FILENAME OF CURREN
      T VERSION";F$:PRINT
RA 80 PRINT"LOADING CODE...";
CS 90 BLOAD(F$),B0,P(AD)
JE 100 PRINT"ADJUSTING CODE...
       ";
JP 110 CK=0:FORI=1TO50:READOF,
       CH:CK=CK+OF+CH:POKEAD+O
       F,FNLB(CH+AD):POKEAD+OF
       +1,FNHB(CH+AD):NEXT
GQ 120 IFCK<>58747THENPRINT:PR
       INT"ERROR IN DATA.
       {2 SPACES}CHECK LINES 1
       90 TO 270":END
GR 130 CK=0:FORI=1TO5:READLA,H
       A,CH:CK=CK+LA+HA+CH:POK
       EAD+LA,FNLB(CH+AD):POKE
       AD+HA,FNHB(CH+AD):NEXT
SH 140 IFCK<>7874THENPRINT:PRI
       NT"ERROR IN DATA.
       {2 SPACES}CHECK LINE 28
       0":END
QF 150 PRINT"DONE.":PRINT
PQ 160 PRINT"SAVE THE NEW VERS
       ION?";:DO:GETKEYA$:LOOP
       UNTILINSTR("YNYN",A$)
DB 170 PRINTA$:IFA$="Y"ORA$="Y
       "THENINPUT"{DOWN}FILENA
       ME";F$:BSAVE(F$),B0,P(A
       D)TOP(AD+944):PRINT
GK 180 BANK15:SYS(AD):PRINT"
       {2 HOME}{CLR}VDC MONITO
       R+ ACTIVATED"
FC 190 END
JX 200 DATA 4,101,10,102,26,83
       6,29,852,35,837,38,853
CB 210 DATA 56,103,63,141,70,1
       96,77,247,84,428,91,447
SA 220 DATA 98,693,136,103,181
       ,146,191,159,242,329,31
       4,329
DS 230 DATA 361,922,384,922,40
       5,922,458,944,545,670,5
       86,670
CJ 240 DATA 589,944,606,944,60
       9,667,615,667
PE 250 DATA 629,944,644,944,69
       1,521,694,940
AP 260 DATA 699,940,705,941,71
       1,852,717,853,728,941,7
       31,942
CE 270 DATA 736,943,739,940,74
       9,941,759,942,769,943,7
       72,941
QX 280 DATA 775,942,778,943,82
       5,941,897,940,902,940,9
       05,941
DG 290 DATA 13,18,51,41,46,854
       ,797,802,809,877,882,51
       ,887,892,854
```

G

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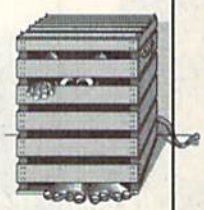

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BASSEM

A MACHINE LANGUAGE ASSEMBLER FOR THE 64 PART 2

EDITOR'S CHOICE

Last month, we introduced *Bassem*, the full-featured, two-pass assembler for the 64. This month, we complete our discussion of its commands and offer tips for its use.

Because *Bassem* is an extension to BASIC, its source files are very similar to BASIC program files. Each line of *Bassem* source code must be preceded by a line number in the range 0–63999, can contain up to 80 characters, and can have multiple commands separated by colons. *Bassem*'s commands and 6502 mnemonics are tokenized, and, like standard BASIC commands, they can be represented using abbreviations. (See Tables 1 and 2.)

In Part 1, we discussed how to get *Bassem* up and running and introduced enough of the command set to allow you to begin writing your own programs. Now, we'll examine the rest of *Bassem*'s commands and explain how to use them.

More Commands

In the following command descriptions, as before, the commands themselves and constant parameters are shown in bold type while variable parameters are shown in bold italic type. Optional parameters are indicated by square brackets, and repeating parameters are represented by ellipses. When only one of several choices is allowed, the parameters are surrounded by parentheses and separated by vertical bars.

WOR ***number*** **[,*number*]...** Places the specified number(s) into the object file in low-byte/high-byte format. Legal values for *number* range from 0 to 65535. You can specify multiple values with one WOR command by separating them with commas.

FLP ***number*** **[,*number*]...** Places the specified number(s) into the object file in five-byte floating-point format. Legal values for *number* range from −1E38 to 1E38. As with the BYT and WOR commands, you can specify multiple values with one FLP command by separating them with commas.

OPZ (01)[,*number*] Tells the assembler how to assemble zero-page addressing modes for those instructions which support it. Setting the first parameter to 1 tells *Bassem* to use zero-page addressing whenever possible. (This is the way most assemblers handle zero-page addressing.) Setting it to 0 tells *Bassem* to use absolute addressing mode.

If, for example, you enter the commands

```
250 OPZ 1:LDA $C6
```

in your source file, the assembler generates the values A5 C6. If you change the OPZ 1 command to OPZ 0, it generates AD C6 00.

The first example is in zero-page addressing mode, and the second is in absolute addressing mode. Zero-page addressing is both shorter and faster, but in some applications where timing is critical, you may want to use absolute addressing instead.

If you're not careful, setting OPZ incorrectly can cause errors during assembly. One such case occurs when you attempt to assemble an instruction which supports X- or Y-indexed, zero-page addressing mode but doesn't support its equivalent absolute addressing mode. If you try to assemble such an instruction (STX $61,Y, for example) with zero-page mode turned off, *Bassem* issues a SYNTAX ERROR message. The error is flagged as a syntax error because the assembler expects the instruction to be followed by a colon or an end-of-line

character but not by a comma.

A 6502 instruction generally has one of two types of arguments: address and data, or value. The second parameter of the OPZ instruction determines which messages *Bassem* prints when an instruction's argument is 0. If OPZ's second parameter is set to 0, no messages are issued; if it's 1, *Bassem* prints a warning when it encounters a 0 address; if the parameter is 2, the assembler issues a warning upon encountering a 0 data value; and if it's 3, it prints warnings for both types of 0 arguments.

Programming Aids

In addition to the commands which affect how your programs assemble, *Bassem* also has commands that aid program development. Although most of these commands are intended to be used only in immediate mode, some can be included in your source file.

LABEL [((*number* | *label* | *string*) [,[(*number* | *label* | *string*)]][CLR)] Displays the labels defined by *Bassem*. Once you've assembled your source file, typing LABEL displays all the labels defined in your program along with their hexadecimal values. Press the CTRL key to slow the display, the SHIFT key to freeze it, or the RUN/STOP key to stop it.

You can display a range of labels by typing the LABEL command followed by the first and last values of the range, separated by a comma. For example, LABEL $A000, 49151 displays all the labels whose values range from 40960 to 49151. The LABEL command is similar to BASIC's LIST command in that you can specify open-ended ranges by leaving off one of the range delimiters (LABEL ,&021 or LABEL $FF81,). Also notice that you can use any of the numeric formats (binary, octal, decimal, or hexadecimal) supported by *Bassem*.

Another feature of the LABEL command allows you to display the value of a specific label or the values of a range of labels using the label names (LABEL CHROUT or LABEL FRELO1, ENV3). If you can't remember exactly how a label name is spelled or you need to know the values of several labels with similar names, you can search for them using a wildcard string. As with Commodore DOS commands, use the question mark (?) to match any one character and the asterisk (*) to match any number of characters. An example label search might look like

```
LABEL "?E*"

HERE = $C000    RESET = $FCE2
2 LABELS DEFINED.
```

Once you've viewed all of the defined labels, you can erase them with the LABEL command's CLR option. Typing LABEL CLR clears or erases the label buffer as defined by the SET command. (For a discussion of the SET command, see Part 1 in the April issue.)

FIND *charstringchar* Searches the source code file in memory for the given string and lists all lines in which a match is found. The *string* parameter is the string you want to search for and the *char* parameters are delimiting characters. You can use any character that's not found in the search string as your delimiter. If you use the double-quotation-mark character (") as the delimiter, the search string will be used as is; otherwise, the string will be tokenized before the search begins.

As *Bassem* searches, it lists each line containing a string that matches the search string. If the lines begin to scroll off the screen, you can slow the display by pressing the CTRL key, freeze it by pressing the SHIFT key, or stop it by pressing RUN/STOP. The following are some examples of valid search commands.

FIND /PRINT/	(search for the PRINT command)
FIND "PRINT"	(search for the word PRINT in a string)
FIND ZXYZ	(search for the variable XY)
FIND @"@	(search for a quotation mark)

AUTO [*increment*] Prints line numbers automatically. The *increment* parameter determines how *Bassem* calculates the next line number. To have *Bassem* print the line numbers for you, enter the AUTO command with an increment value and then enter your first line of code. When you press RETURN to enter the line, *Bassem* prints the next line number. The line number it prints is the current line number plus the increment value.

For example, if you enter the command AUTO 10 and then type the line

```
100 ' WORLD'S GREATEST PROGRAM,
    PART 1
```

Bassem will print 110 as the next line number. To turn off the automatic-line-numbering option, enter the AUTO command by itself. Valid values for *increment* are 0–65535, but an increment of 0 or increments greater than 5000 are pretty useless. While you're in automatic line-numbering mode, if a new line number is the same as an existing line number, the computer prints an apostrophe (') prior to the line number. If this happens, you can press RETURN and the old line won't be changed.

You can stop line numbering in one of three ways: by pressing RETURN on a line with the apostrophe in front of the line number (as described above), by pressing RETURN over an empty new line, or by pressing SHIFT–RETURN on any line. Also, numbering stops if the new line number is higher than 63999. To be safe, you should disable automatic line numbering when you finish using it.

RENUM [*starting line number* [, *increment*]] Changes the line numbers of the program so that they increment by a constant value. The first parameter indicates the line number for the first line of the program. The second parameter gives the step value used in determining the line numbers for each successive line.

For example, typing RENUM 100,5 will renumber the program so that the first line of the program is number 100 and each line after that is 5 greater than the previous line. Entering RENUM without any parameters uses the default values of 10,10. Also, don't use this renumber command on BASIC programs. It renumbers only line numbers. It doesn't change GOTO, GOSUB, or other similar commands.

DEL (*line number* [-[*line number*]]- *line number*) Deletes lines from the source file in memory. The line-number options for the DEL command behave exactly like BASIC's LIST command. Be careful with this command. Typing DEL by itself erases your entire source file from memory. Once it's gone, you can't recover it.

OLD Recovers a source file erased using BASIC's NEW command. This command cannot rescue a program erased with the DEL command. ▷

Table 1: *Bassem* Commands—Abbreviations and Tokens

Command	Abbreviation	Token Value	Command	Abbreviation	Token Value
AFFIX	A Shift-F	$D8 (216)	LABEL	L Shift-A	$CE (206)
AUTO	A Shift-U	$D2 (210)	LFT	L Shift-F	$DA (218)
DEL	none	$D3 (211)	MERGE	M Shift-E	$DC (220)
DIR	none	$D6 (214)	OLD	O Shift-L	$D4 (212)
DISK	DI Shift-S	$CC (204)	PUT	P Shift-U	$D7 (215)
DLIST	D Shift-L	$DB (219)	RENUM	RE Shift-N	$D1 (209)
FIND	F Shift-I	$CD (205)	WRITE	W Shift-R	$D5 (213)
HELP	H Shift-E	$D9 (217)			

HELP Lists the line in which an error has occurred. When it's able, HELP indicates the exact location of the error. If a portion of the listed line is shown in inverse video, the error occurred just before the inversed section; otherwise, the error occurred at the end of the line. If you modify the program, HELP can still list the errant line, but it won't be able to point out the exact location of the error.

LFT [SET|CLR] Sets or clears the formatted listing flag. LFT SET causes the LIST command to format the source lines as it displays them. LFT CLR returns LIST to its normal mode of operation. When you use the LFT SET command, LIST displays each instruction on a single line in the forms described here.

- If the instruction is the first one on a source line, then the line number is printed starting in the first column.
- If the instruction is preceded by a label or a label is defined by the assignment operator, the label is printed starting in the sixth column.
- The instruction itself or the assignment operator for a label definition is printed beginning in the 15th column.
- If the line contains a *Bassem* command, it's printed starting in the 20th column.
- Comments are displayed right after the line number if there are no other instructions on the line. Otherwise they are displayed beginning in the 40th column (the start of the next line on the screen).

The formatted listing option is especially useful when you use the HELP command because the error is more easily identifiable. While formatted listing is activated, you can add lines to your program as you normally would, but don't edit formatted lines if they occupy more than one screen line.

Disk Commands

In addition to its numerous other commands, *Bassem* also adds seven commands for controlling your disk drive. *Bassem* disk commands default to drive 8 when you don't specify a device number. Also, commands that require a string or filename as a parameter accept up to 41 characters.

DISK [(*string* [, *device number*]| *default device number*)] Sends a string to the disk drive command channel, displays the drive status, or sets the default drive number. If you enter the DISK command followed by a string, *Bassem* sends the string to the default drive's command channel. This function is useful for performing tasks such as scratching files or validating disks. When typed alone, the DISK command displays the drive's current status.

Another feature of the DISK command allows you to change the default drive's device number. To change the default drive, enter DISK followed by the device number. *Bassem* allows you use drives 8–11 as the default.

DIR [*string* [, *device number*]] Displays a disk directory on the screen. Entering DIR by itself displays all of the files from the default drive on the screen. You can specify which files DIR displays with the *string* parameter. The string can contain a valid filename or Commodore wildcards. (See your disk drive user's manual for more information on wildcards.) Below are some examples.

```
DIR "*"
DIR "*=s"
DIR "BA*"
```

The first example is equivalent to typing DIR by itself, the second displays the sequential files on the disk, and the third displays the files beginning with the characters BA. When using DIR's *string* parameter, you may also specify which drive to use. Like the DISK command, DIR accepts drive numbers 8–11.

If the filenames scroll off the screen as you display a disk's directory, you can slow the scrolling by pressing the CTRL key. You can freeze the display temporarily by pressing the SHIFT key or stop it completely by pressing RUN/STOP.

WRITE *filename* [, *device number*] Writes the object code generated by *Bassem* to disk. The WRITE command allows you to save your machine language program to disk. The *filename* parameter is the name of the file to contain the machine language. You must add the extension ,P,W to the filename to prevent a disk error. You can specify which disk drive to write the code to by including the drive number after the filename. For example, WRITE "CL.ML,P,W",9 saves the object to the file CL.ML on the disk in drive 9.

For *Bassem* to write the object code correctly, you must place the WRITE command before the BAS and PASS1 commands. The following program fragment shows the order that's required.

```
10 WRITE "CODE,P,W"
20 BAS $C000
30 PASS 1
.
. your code
.
1000 PASS 2
```

You may want to assemble your program without writing the object

Table 2: 6502 Instructions—Abbreviations and Tokens

Ins.	Abbr.	Token	Ins.	Abbr.	Token	Ins.	Abbr.	Token	Ins.	Abbr.	Token
ADC	A-D	$FE-80	CMP	-	$FE-90	NOP	-	$FE-A0	STY	-	$FE-AF
AND	A-N	$AF	CPX	C-P	$FE-91	ORA	-	$B0	TAX	-	$FE-B0
ASL	-	$FE-81	CPY	-	$FE-92	PHA	P-H	$FE-A1	TAY	-	$FE-B1
BCC	B-C	$FE-82	DEC	-	$FE-93	PHP	-	$FE-A2	TSX	T-S	$FE-B2
BCS	-	$FE-83	DEX	-	$FE-94	PLA	P-L	$FE-A3	TXA	T-X	$FE-B3
BEQ	B-E	$FE-84	DEY	-	$FE-95	PLP	-	$FE-A4	TXS	-	$FE-B4
BIT	B-I	$FE-85	EOR	E-O	$FE-96	ROL	R-O	$FE-A5	TYA	T-Y	$FE-B5
BMI	B-M	$FE-86	INC	-	$FE-97	ROR	-	$FE-A6	PASS	P-A	$CF
BNE	B-N	$FE-87	INX	-	$FE-98	RTI	R-T	$FE-A7	SET	S-E	$D0
BPL	B-P	$FE-88	INY	-	$FE-99	RTS	-	$FE-A8	BAS	B-A	$FE-BB
BRK	B-R	$FE-89	JMP	J-M	$FE-9A	SBC	S-B	$FE-A9	BUF	B-U	$FE-B9
BVC	B-V	$FE-8A	JSR	J-S	$FE-9B	SEC	-	$FE-AA	BYT	B-Y	$FE-B6
BVS	-	$FE-8B	LDA	L-D	$FE-9C	SED	-	$FE-AB	FLP	F-L	$FE-BC
CLC	-	$FE-8C	LDX	-	$FE-9D	SEI	-	$FE-AC	OPZ	-	$FE-B7
CLD	-	$FE-8D	LDY	-	$FE-9E	STA	-	$FE-AD	WOR	W-O	$FE-B8
CLI	-	$FE-8E	LSR	L-S	$FE-9F	STX	-	$FE-AE	WRT	-	$FE-BA
CLV	-	$FE-8F									

The AND and OR instructions can be used as logical operators in BASIC or as 6502 instructions in your source code (AND and ORA).

code to memory or disk until you're sure that it doesn't contain syntax errors. Once you're sure your program assembles correctly, you can add the WRITE command to write the object code to disk.

PUT (*line number* [-[*line number*]]- *line number*), *filename* [, *device number*] Saves portions of the source program to disk. The *line number* parameters are used to specify which lines of code should be saved. All of the line-number options of BASIC's LIST command are available. The *filename* parameter must be a valid Commodore filename. You can optionally specify the drive number where the file is to be saved.

AFFIX *filename*[, *device number*] Appends a source file to the end of the source file in memory. AFFIX works like LOAD except that the file doesn't overwrite the current file in memory. If there is no file in memory, AFFIX works just like LOAD.

AFFIX doesn't merge the file on disk with the file in memory (see MERGE, below). It doesn't replace existing source lines with lines from the loaded file if the two have the same line number. It also doesn't arrange the two files into line-number order. It simply appends the loaded file to the one in memory.

DLIST *filename* [, *device number*] Lists a file from disk without disturbing the file in memory. DLIST works like BASIC's LOAD command, but the DLISTed file is only displayed on the screen. The file in memory remains unaltered. If formatted listing mode is set, the file will be listed to the screen with one instruction per line. (See the LFT command for details.) You can control how quickly the program scrolls by using the CTRL and SHIFT keys, and you can stop the listing at any time by pressing the RUN/STOP key.

MERGE *filename* [, *device number*] Merges a program from disk with the one in memory. MERGE reads a program from disk, lists each line to the screen, and adds the line to the program in memory. If the programs have common line numbers, the program on disk takes precedence. Be sure that formatted listing mode is turned off before using the MERGE command (see LFT).

Error Messages

To help you debug your programs, *Bassem* adds several error and warning messages to BASIC.

OUT OF LABEL MEMORY. *Bassem* has filled the label storage buffer. To correct this error, you should increase the buffer size using the SET command. (*Bassem* itself was assembled using the default buffer size without overflowing the storage buffer.)

LABEL ALREADY EXISTS. You've tried to define a label that already exists in your program. To resolve the conflict, change one of the labels. You can use the FIND command to search for the other copy of the label.

LABEL NOT FOUND. You've referenced a label that hasn't been defined. All labels must be defined before they can be used. Be sure you haven't misspelled the label name or forgotten to define the label.

BRANCH TOO LONG. You've attempted to branch to a label that is out of the range of the instruction. A 6502 branch instruction can jump up to 127 bytes forward or 128 bytes backward. Rewrite your code to use a JMP instruction instead of a branch. (The JMP instruction can address all of the 64's memory.)

DIRECT MODE ONLY. You've tried to use a command in your source program that is only allowed in immediate mode.

?ZERO VALUE IN xxxxx and ?ZERO ADDRESS IN xxxxx. These messages are warnings that indicate an instruction had a zero value for its argument. You can turn off these warnings with the OPZ command.

Notes and Programming Tips

Bassem is a two-pass assembler. In the first pass, it calculates the addresses of the labels (except for those defined with the assignment operator) using a program counter (PC). When you define the starting address for your program using the BAS command, you're actually setting the PC. As it goes through the first pass, *Bassem* determines the length of each instruction and adds that value to the PC. When it encounters a label that isn't followed by the assignment operator (=), it assigns the current PC value to that label. This has the effect of assigning the address of the instruction to the label.

If the argument of an instruction is a label, *Bassem* first checks to see if the label is already defined. If so, it calculates the length of the instruction based on the value of the label. If the label is undefined, it calculates the length for the worst possible case. If you attempt to use an instruction with an expression containing an undefined label as its argument, *Bassem* generates an UNDEFINED LABEL error.

To avoid this error, you can arrange the expression so that the undefined label is the first operand in the expression. For example, you'd rewrite 14+←LINWIDTH*8 as ←LINWIDTH*8+14. If you can't rearrange the expression without changing its meaning, add a dummy label at the beginning of the expression and then define the dummy label just before the PASS 2 statement at the end of the file. For example, you can't change 8/←FUTUREBYTE to ←FUTUREBYTE/8 because they aren't mathematically equivalent. To get *Bassem* to assemble this expression correctly, you'd have to change it to ←DUMMY+8/←FUTUREBYTE and then place the statement ←DUMMY = 0 at the end of the file.

Bassem uses several memory locations in lower memory that you should be aware of. Don't try to modify these unless it's absolutely necesary. Below are the locations and their uses.

Locations	Use
$02 (2)	Pass 1 or 2 flag
$FB-$FC (251-252)	Program counter
$FD-$FE (253-254)	Pointer to the next available byte in label buffer
$02A7-$02FF (679-767)	Buffer for current label name, FLP instruction, and BUF instruction.
$0334-$033B (820-827)	Temporary buffer for preserving several page-three pointers.

Notice in the fourth entry that the same buffer is used to hold the current label name and the byte patterns of the BUF instruction. This means that you can't use labels as arguments to the BUF command.

You can change the character used to indicate labels by POKEing the ASCII value of the new character into location $9D31 (40241). Be sure not to use characters that are reserved as BASIC operators (+, −, *, /, <, >, and .), as these have special meanings in BASIC and shouldn't be used.

If you change the label marker this way, you'll have to edit all of the labels in your source files. You can make the change permanent by loading *Bassem* and typing NEW. Then enter the following commands from direct mode.

```
POKE40239,character:POKE43,240:POKE
44,135:POKE45,0:POKE46,160:SAVE
"filename",8
```

Character is the ASCII value of the new label marker, and *filename* is the name of the file in which to save *Bassem*. If you change the label marker this way, you won't need to edit your old source files.

Occasionally, the FIND command will list a line that doesn't contain the string that you were searching for. This usually happens when you're searching for *Bassem* or BASIC commands that have been tokenized. This is caused by the two-byte tokens used for the ML instructions. For example, INY is tokenized as $FE $99 (254 153) and PRINT is tokenized as $99 (153). When you search for PRINT, the FIND routine assumes that the $99 of the INY token is a PRINT token. **G**

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CUSTOM CURSOR

Want to dress up your cursor? Here's a short machine language routine that creates custom cursors for your BASIC programs. For the 64.

Gordon Chamberlin

How many times have you looked at that flashing block on your text screen and wished you could change it? Well, now you can. With *Custom Cursor*, a relocatable machine language utility for the 64, you'll have a choice of eight distinct cursor patterns, along with the standard cursor. Designed specifically for use with BASIC programs, this routine also lets you change the cursor color and blink speed.

Getting Started

Custom Cursor is a two-part program. The first portion (lines 5–610) demonstrates *Custom Cursor*'s features; the remainder (lines 63000–63380) contains the relocatable machine language (ML) routine—stored in DATA statements—that actually modifies the cursor.

To prevent typing mistakes while entering *Custom Cursor*, use *The Automatic Proofreader*, found elsewhere in this issue. Be sure to save a copy of the program to disk or tape when you've finished.

To install *Custom Cursor*, first assign a starting address (SA) for the routine in line 10. If you define SA as 0, then the ML code relocates itself to the top of BASIC RAM. If SA is some other value, the code is placed at the address represented by this number. Note that no range-checking is performed by the program, so be careful that you don't overwrite another program with the code.

Next, run the program. Once the ML has been POKEd into memory, follow the instructions on the screen to observe the different cursor effects. If you wish to use this routine in your own programs, you must include lines 63000–63380. Also, be sure to place the following lines at the beginning of your program before accessing *Custom Cursor*.

```
10 SA=49152:REM STARTING
   ADDRESS
20 GOSUB63000:CLR
30 SA=PEEK(253)*256+PEEK(254):
   CO=SA+3:CF=SA+6:REM DEFINE
   JUMP TABLE ADDRESSES
```

The Commands

Custom Cursor is accessed using three separate SYS commands. (The SYS addresses for these commands are calculated by line 30 above.) The first command is used to initialize the custom-cursor routine and to specify a particular cursor pattern. It has the syntax

SYS SA,*n*,*c*,*s*

The *n* is the cursor number (0–8). In addition to the normal cursor (using a value of 0 causes the routine to be deactivated), there are eight distinct cursors (use values in the range 1–8), each forming a unique pattern on the screen. Cursors 1–5 can be used with upper- or lowercase. Cursors 6–8 are for uppercase use only and form some of the more interesting patterns.

The *c* is the cursor color (0–16). To make the cursor appear in one of the standard Commodore colors distinct from the text color, assign *c* a value in the range 0–15. To make the cursor the same color as the text, use a value of 16.

The cursor speed is represented by

s (0–255). A value of 1 is the fastest; a value of 0 is the slowest (it wraps at 255). Although each cursor pattern has its own default speed, this parameter allows you to select the most appropriate speed for a particular cursor image.

The second command, SYS CO,*w*, tells the computer to execute the system cursor-blink routine. If *w* is 0 or not defined, then *Custom Cursor* will return immediately without executing the computer's normal cursor-blink routine. If *w* is 1, it will wait for a keypress before returning. If it is 2 or higher, it will call the cursor-off routine (see below) before returning.

The third and final command, SYS CF, turns off the computer's own cursor-blink routine (don't confuse this with deactivating *Custom Cursor*). This command is used to prevent the cursor image from being printed when you're moving around the screen.

Custom Cursor

```
XQ 5 REM COPYRIGHT 1990 COMPUT
     E! PUBLICATIONS, INC. - A
     LL RIGHTS RESERVED
CX 10 SA=49152:REM STARTING AD
      DRESS
QR 20 GOSUB63000:CLR
QE 30 SA=PEEK(253)*256+PEEK(25
      4):CO=SA+3:CF=SA+6:REM D
      EFINE JUMP TABLE ADDRESS
      ES
SG 40 DIM SP(8):REM DEFAULT SP
      EEDS
DJ 50 RESTORE
JC 60 FOR A=0 TO 8:READ SP(A):
      NEXT
PP 70 DATA 0,2,3,5,9,255,3,3,3
CC 80 CN=1:CC=16:S=SP(CN)
QD 90 SYS SA,CN,CC,S
DS 100 PRINT"{8}{CLR}";
GK 110 PRINT" USE:"
XK 120 PRINT"{3 SPACES}F1/2 -
       {SPACE}TO CHANGE NUMBER
       "
ES 130 PRINT"{3 SPACES}F3/4 -
       {SPACE}TO CHANGE COLOR"
HC 140 PRINT"{3 SPACES}F5/6 -
       {SPACE}TO CHANGE SPEED"
CM 150 PRINT"{3 SPACES}F7 - TO
        VIEW HELP"
DK 160 PRINT"{3 SPACES}F8 - TO
        QUIT"
MA 170 PRINT"{2 DOWN}
       {2 SPACES}YOU MAY TYPE
       {SPACE}ANY KEYS YOU WIS
       H: ";
XS 180 GOSUB490
QM 190 SYS CO,2:GETG$:G=ASC(G$
       )
MQ 200 IF G<133 OR G>141 THEN4
       60
KE 210 IF G$<>"{F1}" THEN230
RS 220 CN=CN+1:GOTO250
ED 230 IF G$<>"{F2}" THEN280
DR 240 CN=CN-1
MH 250 IF CN>8 THEN CN=CN-9:GO
       TO250
ER 260 IF CN<0 THEN CN=CN+9:GO
       TO260
AG 270 S=SP(CN):GOTO420
XJ 280 IF G$<>"{F3}" THEN300
DE 290 CC=CC+1:GOTO320
PB 300 IF G$<>"{F4}" THEN350
RK 310 CC=CC-1
GD 320 IF CC>16 THEN CC=CC-17:
       GOTO320
GK 330 IF CC<0 THEN CC=CC+17:G
       OTO330
HJ 340 GOTO420
RR 350 IF G$="{F5}" THEN S=S+1
       :GOTO400
DE 360 IF G$="{F6}" THEN S=S-1
       :GOTO410
AB 370 IF G$="{F7}" THEN100
FC 380 IF G$="{F8}" THEN END
AM 390 :
MJ 400 IF S>255 THEN S=S-256:G
       OTO400
MH 410 IF S<0 THEN S=S+256:GOT
       O410
GQ 420 IF CN=0 THEN SYS SA,CN:
       GOTO440
RM 430 SYS SA,CN,CC,S
XS 440 GOSUB490
SC 450 GOTO190
QM 460 PRINTG$;
GD 470 GOTO190
EA 480 STOP
JQ 490 REM PRINT CURSORING INF
       O
FB 500 SYS CF
QR 510 POKE783,1:SYS65520:SC=P
       EEK(646):REM SAVE CURRE
       NT CURSOR POSITION AND
       {SPACE}COLOR
PP 520 PRINT"{8}{HOME}"TAB(27)
       "CURSOR INFO-"
DH 530 PRINT TAB(28)"NUMBER: "
       ;
FX 540 PRINT RIGHT$(STR$(CN),1
       )
MC 550 PRINT TAB(29)"COLOR: ";
QQ 560 PRINT RIGHT$("0"+MID$(S
       TR$(CC),2),2)
GG 570 PRINT TAB(29)"SPEED: ";
KH 580 PRINT RIGHT$("00"+MID$(
       STR$(S),2),3)
QC 590 POKE783,0:SYS65520:POKE
       646,SC:REM RESTORE CURS
       OR POSITION AND COLOR
HP 600 RETURN
GH 610 :
CM 63000 A=PEEK(61)+PEEK(62)*2
         56:POKE66,INT(A/256):
         POKE65,A-PEEK(66)*256
HE 63010 REM NEXT LINE DOES A
         {SPACE}SELECTIVE REST
         ORE
JS 63020 PRINT"{2 DOWN}{CLR}
         {2 SPACES}PLEASE WAIT
          5 SECONDS...READING
         {SPACE}DATA"
JQ 63030 NB=355
PC 63040 IF SA<>0 THEN63070
RA 63050 E=PEEK(55)+PEEK(56)*2
         56
GJ 63060 B=E-NB:GOTO63080
QX 63070 B=SA:E=B+NB
CH 63080 FORA=BTOE-1:READD%:IF
         D%>=0THEN63100
XR 63090 L=D%+E:D%=L/256:D1%=L
         -D%*256:POKEA,D1%:A=A
         +1
FF 63100 POKEA,D%:NEXT
JJ 63110 A=B+127:POKE B+12,A/2
         56:POKE B+31,A-INT(A/
         256)*256
GE 63120 PRINT"{2 SPACES}COMPL
         ETED"
HG 63130 IF SA<>0 THEN63150
MJ 63140 POKE 55,B-INT(B/256)*
         256:POKE 56,B/256
MD 63150 POKE 253,B/256:POKE 2
         54,B-PEEK(253)*256
AM 63160 RETURN
CS 63170 :
ES 63180 DATA{2 SPACES}76,-344
         ,76,-150,76,-132,49,2
         34,160,192,204,21,3,2
         40
XX 63190 DATA{2 SPACES}26,174,
         20,3,142,-346,174,21,
         3,142,-345,162,127,56
         ,120
KB 63200 DATA{2 SPACES}142,20,
         3,140,21,3,88,176,1,9
         6,32,-243,224,1,176,8
DD 63210 DATA{2 SPACES}174,-34
         6,172,-345,144,230,22
         4,9,144,5,162,14,76,5
         5,164
AQ 63220 DATA{2 SPACES}202,138
         ,10,168,185,-111,141,
         -189,185,-110,141,-18
         8
MF 63230 DATA{2 SPACES}189,-95
         ,141,-216,169,0,141,-
         192,32,-243,224,17,17
         6
SJ 63240 DATA{2 SPACES}217,142
         ,-165,32,-243,142,-21
         6,96,32,121,0,208,3,1
         04
RK 63250 DATA{2 SPACES}104,96,
         32,155,183,96,76,97,2
         34,32,234,255,165,204
         ,208,246,198
GH 63260 DATA{2 SPACES}205,208
         ,242,169,2,133,205,16
         4,211,165,207,208,14,
         177,209,230,207
SD 63270 DATA{2 SPACES}133,206
         ,32,36,234,177,243,14
         1,135,2,162,0,232,189
         ,-87,208
AR 63280 DATA{2 SPACES}4,162,0
         ,240,247,142,-192,201
         ,32,208,8,174,135,2,1
         65,206
AX 63290 DATA{2 SPACES}76,94,2
         34,162,16,224,16,144,
         3,174,134,2,201,160,2
         08,240,76
EM 63300 DATA{2 SPACES}90,234,
         169,0,133,204,32,-243
         ,138,240,7,165,198,24
         0,252,202
MK 63310 DATA{2 SPACES}208,1,9
         6,169,1,133,204,165,2
         07,240,012,165,206,17
         4,135,2,160
MX 63320 DATA{2 SPACES}0,132,2
         07,32,19,234,96,-87,-
         54,-45,-36,-33
MA 63330 DATA{2 SPACES}-31,-22
         ,-5,2,3,5,9,255,3,3,3
         ,99,119,120
AA 63340 DATA{2 SPACES}226,249
         ,239,228,160,227,247,
         248,98,121,111,100,32
         ,100,111,121,98
PE 63350 DATA{2 SPACES}248,247
         ,227,160,228,239,249,
         226,120,119,99,32,0,1
         24,225,108,98
QH 63360 DATA{2 SPACES}123,97,
         126,226,0,110,93,112,
         64,109,93,125,64,0,10
         0,32,0
BE 63370 DATA{2 SPACES}160,0,2
         26,95,225,233,98,223,
         97,105,0,99,69,68,64,
         70,82
MK 63380 DATA{2 SPACES}100,32,
         100,82,70,67,68,69,99
         ,32,0,64,77,93,78,0
```

G

MINIMAP

Add a graphics window to your BASIC program displays with this short machine language routine for the 64.

Keith M. Groce

Many programs could certainly benefit from the addition of a graphics display. But setting up a graphics screen on the 64 is no easy task; you have to reconfigure memory, create the graphics display, flip between text and graphics screens, and so on. For most programmers, the results are simply not worth the effort.

MiniMap offers you a convenient alternative. This powerful graphics wedge uses sprites to create a small bitmap (96 × 42 pixels) on the text screen. To enable you to plot points and draw lines on this bitmap, *MiniMap* adds five new commands to BASIC. At the same time, it preserves all the usual features of the text screen, such as scrolling, input statements, and so on. Best of all, *MiniMap* lets you save your BASIC program along with the graphics window as a single executable file.

Getting Started

Since *MiniMap* is written entirely in machine language, you'll need to use *MLX*, the machine language entry program found elsewhere in this issue, to type it in. When *MLX* prompts you, respond with the values given below.

Starting address: 0801
Ending address: 0B68

When you've finished typing in the program, save it to disk using the filename MINIMAP.

A demo program, written in BASIC, is included with *MiniMap*. To type it in, you'll need to use *The Automatic Proofreader*, the BASIC typing aid that's also found in this issue. Be sure that *MiniMap* isn't in memory when you run *Proofreader* (they conflict with one another). When you've finished typing, save the program to the disk that contains MINIMAP using the filename DEMO.

The New Commands

To install *MiniMap* in memory, type LOAD"MINIMAP",8,1, followed by RUN. The program adds the new commands to BASIC, initializes the bitmap area, and then moves the start of BASIC above *MiniMap*.

Each *MiniMap* command begins with the ampersand symbol (&) and a letter, followed by one or more parameters, and is available from both direct and program mode. The following paragraphs describe the five commands.

&C*t* Clears the bitmap to the display mode specified by parameter *t*. If *t* equals 0, all the pixels in the map are turned off; only the points that you plot are visible. If *t* is in the range 0–127, all pixels are turned on. A value of *t* above 127 causes all pixels in the bitmap area to be shown in inverse.

&I*s,c* Initializes the size and color of the bitmap. If *s* equals 0, a small bitmap is used; any other value of *s* causes the bitmap to be large (it's made up of expanded sprites). The color parameter *c* can be set to any one of the standard Commodore colors (0–15).

&P*x,y,t* Plots a point on the bitmap. The *x* parameter can be any value in the range 0–95, while *y* must be in the range 0–41. If *t* equals 0, the plotted point is turned off. If *t* is in the range 1–127, the point is turned on. A value of *t* greater than 127 causes the point to appear in inverse.

&L*x1,y1,x2,y2,t* Draws a line from point *x1,y1* to point *x2,y2*. The *t* parameter is the same as with the &P command.

&R*x1,y2,x2,y2,t* Plots a rectangle with corners at *x1,y1* and *x2,y2*. Again, *t* is the same as before.

Putting It All Together

For a quick look at what can be done with *MiniMap*, install it according to the instructions above and then load and run the demo program (type LOAD "DEMO",8, followed by RUN). As you can see, *MiniMap* can create some very interesting effects.

When you've finished viewing the demo, exit the program and type LIST to see how the *MiniMap* commands are used. You can experiment with the commands by changing the parameters and rerunning the program. Once you're familiar with how to use them, you can start adding *MiniMap* graphics to your own programs.

When you've finished with your creation, you can attach *MiniMap* to it and save the two as a single, stand-alone program. To do this, install *MiniMap*, load your program containing the new commands, and then enter the following line.

```
POKE 43,1:POKE 44,8:SAVE"filename",8
```

If you later load and list this combined program, only one line will be displayed on your screen:

```
10 SYS (2064)
```

A program created in this manner can still be modified from BASIC. Simply run the program and then press RUN/STOP–RESTORE to exit to BASIC. When you type LIST, your program will once again look like a normal BASIC program. You can now make the necessary changes in the program. When you're satisfied with the results, resave the program using the technique described above.

Helpful Hints

Since *MiniMap* requires you to supply coordinates for the plotting routines, you may find it easier to port your graphics

directly from a paint program. For instance, the short program that follows will enable you to copy the upper left corner (a 96 × 42 pixel area) of a *Doodle* bitmap into *MiniMap*.

```
10 M=46*64:B=24576:K=0
20 FOR R=0 TO 5:FOR Y=0 TO 7:FOR
   C=0 TO 11
30 IF R>4 THEN IF Y>1 THEN Y=7:
   GOTO 80
40 IF R>1 THEN IF Y>4 THEN K=193
50 S=B+C*8+R*320+Y
60 D=M+C+61*INT(C/3)+R*24+Y*
   3+K
70 POKE D,PEEK(S)
```

MiniMap stores the sprite shapes that make up its bitmap in locations 2944–3457. To clear this area, just use the &I command. Also, if you wish to place the bitmap window behind the text display, POKE a 255 into location 53275 (the sprite-priority register).

To print out your *MiniMap* displays, use *PrintScreen* (December 1987) or *PrintScreen 1526* (December 1988). These utilities dump sprites along with text, so they're perfect for obtaining a hardcopy of a *MiniMap* screen. **G**

MiniMap

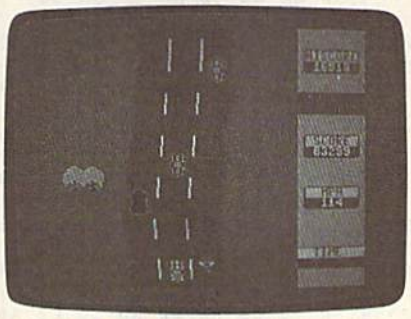
```
0801:0B 08 00 00 9E 32 30 36 EC
0809:31 00 00 00 A9 00 8D 81 9B
0811:0D A9 82 85 2B A9 0D 85 5A
0819:2C A9 81 85 7A A9 0D 85 4C
0821:7B A9 4C 85 73 A9 99 85 36
0829:74 A9 08 85 75 A9 FF F0 7A
0831:12 A0 00 B9 5B 0B 99 81 C9
0839:0D C8 C0 0D D0 F5 A9 00 9C
0841:8D 2F 08 A9 01 8D 72 0B AD
0849:A9 01 8D 73 0B AE 86 02 79
0851:4C 5D 08 20 9B B7 8E 73 2E
0859:0B 20 9B B7 A0 07 8A 99 B5
0861:27 D0 88 10 FA A9 FF 8D 57
0869:15 D0 A9 00 AC 73 0B F0 A7
0871:04 A9 FF A0 10 8D 17 D0 AD
0879:8D 1D D0 A2 00 B9 2B 0B 24
0881:9D 00 D0 C8 E8 E0 10 D0 C2
0889:F4 A2 00 A0 2E 98 9D F8 CE
0891:07 C8 E8 E0 08 D0 F6 60 54
0899:E6 7A D0 02 E6 7B 20 79 D4
08A1:00 C9 26 F0 0C 4C 79 00 7C
08A9:AE 79 0B AC 7A 0B 4C 79 AD
08B1:00 8E 79 0B 8C 7A 0B BA 64
08B9:BD 01 01 C9 E6 F0 04 C9 72
08C1:8C D0 E5 BD 02 01 C9 A7 34
08C9:F0 04 C9 A4 D0 DA 20 73 7C
08D1:00 C9 50 D0 06 20 0A 09 39
08D9:4C 01 09 C9 4C D0 06 20 DF
08E1:97 09 4C 01 09 C9 52 D0 7E
08E9:06 20 B9 0A 4C 01 09 C9 1F
08F1:49 D0 06 20 54 08 4C 01 F9
08F9:09 C9 43 D0 03 20 FE 0A 17
0901:AE 79 0B AC 7A 0B 4C 79 07
0909:00 20 9B B7 8E 70 0B 20 7E
0911:9B B7 8E 71 0B 20 9B B7 8F
0919:8E 72 0B A9 80 85 FB A9 C6
0921:0B 85 FC AC 71 0B 8C 74 C9
0929:0B C0 15 90 08 98 E9 15 28
0931:8D 74 0B E6 FC AD 70 0B 81
0939:4A 4A 4A 18 65 FB 85 FB EF
0941:A0 00 38 AD 70 0B E9 18 21
0949:90 04 C8 4C 47 09 A9 00 34
0951:C0 00 F0 07 18 69 3D 88 BB
0959:4C 53 09 18 65 FB 85 FB 2B
0961:90 02 E6 FC AD 74 0B 0A 48
0969:18 6D 74 0B A8 AD 70 0B 0A
0971:29 07 AA A9 80 E0 00 F0 42
0979:05 4A CA 4C 78 09 AE 72 76
0981:0B D0 07 49 FF 31 FB 4C CB
0989:94 09 10 05 51 FB 4C 94 22
0991:09 11 FB 91 FB 60 20 9B 42
0999:B7 8E 6C 0B 20 9B B7 8E D6
09A1:6D 0B 20 9B B7 8E 6E 0B CA
09A9:20 9B B7 8E 6F 0B 20 9B 16
09B1:B7 8E 72 0B AE 6C 0B 8E 0E
09B9:70 0B EC 6E 0B 90 15 A2 B2
09C1:CA 8E 41 0A 8E A3 0A 38 F4
09C9:AD 6C 0B ED 6E 0B 8D 75 3E
09D1:0B 4C E7 09 A2 E8 8E 41 21
09D9:0A 8E A3 0A 38 AD 6E 0B 0A
09E1:ED 6C 0B 8D 75 0B AC 6D DE
09E9:0B 8C 71 0B CC 6F 0B 90 4E
09F1:15 A0 88 8C 60 0A 8C 84 59
09F9:0A 38 AD 6D 0B ED 6F 0B A5
0A01:8D 76 0B 4C 19 0A A0 C8 9A
0A09:8C 60 0A 8C 84 0A 38 AD EF
0A11:6F 0B ED 6D 0B 8D 76 0B BA
0A19:AD 76 0B CD 75 0B 90 03 DB
0A21:4C 67 0A AD 75 0B 4A 49 07
0A29:FF 8D 77 0B EE 77 0B AE 5A
0A31:70 0B EC 6E 0B D0 03 4C B2
0A39:AA 0A 20 1C 09 AE 70 0B D9
0A41:EA 8E 70 0B 18 AD 77 0B 9E
0A49:6D 76 0B 8D 77 0B 30 DF 14
0A51:F0 DD 38 AD 77 0B ED 75 70
0A59:0B 8D 77 0B AC 71 0B EA 22
0A61:8C 71 0B 4C 30 0A AD 76 B9
0A69:0B 4A 49 FF 8D 77 0B EE 0E
0A71:77 0B AC 71 0B CC 6F 0B 26
0A79:D0 03 4C AA 0A 20 1C 09 FC
0A81:AC 71 0B EA 8C 71 0B 18 B0
0A89:AD 77 0B 6D 75 0B 8D 77 F4
0A91:0B 30 DF F0 DD 38 AD 77 E4
0A99:0B ED 76 0B 8D 77 0B AE 3D
0AA1:70 0B EA 8E 70 0B 4C 73 B2
0AA9:0A AE 6E 0B 8E 70 0B AC E5
0AB1:6F 0B 8C 71 0B 4C 1C 09 B3
0AB9:20 9B B7 8E 68 0B 20 9B EF
0AC1:B7 8E 69 0B 20 9B B7 8E A0
0AC9:6A 0B 20 9B B7 8E 6B 0B 6D
0AD1:20 9B B7 8E 72 0B A0 00 BD
0AD9:8C 78 0B A2 00 AC 78 0B 8C
0AE1:B9 4B 0B A8 B9 68 0B 9D B4
0AE9:6C 0B EE 78 0B E8 E0 04 1E
0AF1:D0 EB 20 B5 09 AC 78 0B BF
0AF9:C0 10 D0 DF 60 20 9B B7 FC
0B01:A0 00 8A D0 03 4C 0D 0B 34
0B09:30 0C A9 FF 99 80 0B 99 ED
0B11:80 0C C8 D0 F7 60 B9 80 C5
0B19:0B 49 FF 99 80 0B B9 7F C3
0B21:0C 49 FF 99 7F 0C C8 D0 B7
0B29:ED 60 85 81 9C 81 B4 81 EC
0B31:CC 81 85 96 9C 96 B4 96 67
0B39:CC 96 55 6D 85 6D B5 6D 97
0B41:E5 6D 55 97 85 97 B5 97 57
0B49:E5 97 00 01 02 01 02 01 61
0B51:02 03 02 03 00 03 00 03 A8
0B59:00 01 00 8C 0D 01 00 26 0B
0B61:43 30 3A A2 00 00 00 00 96
```

Demo

```
HQ 10 REM COPYRIGHT 1990 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
EG 20 M1$="{CYN}MINIMAP DEMONS
      TRATION ... COPYRIGHT 19
      90 COMPUTE! "
AM 30 M1$="{40 SPACES}"+M1$:M1
      =LEN(M1$)
KX 40 M2$="{6}{3 SPACES}SINCE
      {SPACE}THE {WHT}MINIMAP
      {6} IS OVER THE TEXT
      {2 SPACES}"
EH 50 M3$="{YEL}YOU CAN USE NO
      RMAL TEXT-SCREEN EFFECTS
       "
HX 60 M4$="{WHT}{2 SPACES}MINI
      MAP {8}GIVES YOU COMMAND
      S TO PLOT{2 SPACES}"
EX 70 M5$="POINTS, LINES AND R
      ECTANGLES WHICH CAN "
DA 80 M6$="{4 SPACES}BE USED T
      O CREATE OTHER FIGURES
      {4 SPACES}"
FD 90 M7$="{4}{7 SPACES}++++++
      ++++++++++++++++"
BC 95 M9$="{40 @}"
PC 100 M8$="{7} PRESS {RVS}RET
      URN{OFF} TO REPEAT OR
      {RVS}SPACE{OFF} TO END"
CM 110 TB$="{HOME}{25 DOWN}":C
      =1
JP 120 POKE53281,0:POKE53280,0
      :PRINT"{CLR}":&C0:&I1,4
      :RESTORE:PRINTCHR$(142)
HR 125 X1=4:Y1=38:FORN=1TO37:R
      EADX,Y,T:&LX1,Y1,X,Y,T:
      X1=X:Y1=Y:NEXT
PD 130 &R1,1,94,40,1:FORN=1TO5
      :&C128:FORT=0TO500:NEXT
      :NEXT:X=1
EF 140 &C0:&I2*RND(0),C
HJ 150 X1=95*RND(0):X2=95*RND(
      0)
KF 160 Y1=41*RND(0):Y2=41*RND(
      0)
XM 170 &RX1,Y1,X2,Y2,1
XG 180 C=15AND(C+1):FORT=1TO50
      :NEXT
QB 190 PRINTLEFT$(TB$,13);MID$
      (M1$,X,40):X=X+1:IFX>M1
      THEN210
DS 200 GOTO140
FK 210 &C0:&I1,10:PRINTLEFT$(T
      B$,7);M2$:PRINTLEFT$(TB
      $,20);M3$;"{HOME}"
CD 220 CS=14:FORN=1TO6:PRINTCH
      R$(CS):CS=156-CS
FR 230 FORX=1TO95STEP3:&LX,0,(
      95-X),41,128:NEXT
XK 240 FORY=1TO41STEP3:&L95,Y,
      0,(41-Y),128:NEXT
HM 250 NEXT:PRINT"{CLR}"
FE 260 &C0:&I1,13:PRINTLEFT$(T
      B$,5);M4$:PRINTM5$:PRIN
      TLEFT$(TB$,20);M6$
JJ 270 PRINTLEFT$(TB$,7):FORN=
      1TO11:PRINTM7$:NEXT
QR 280 K=↑/180:X1=0:Y1=20
XD 290 FORX=1TO95:Y=20+18*SIN(
      14*X*K)
PH 300 &LX1,Y1,X,Y,1:X1=X:Y1=Y
      :NEXT:FORT=0TO1000:NEXT
      :PRINT"{CLR}":RESTORE
MR 310 &C0:&I0,1:X1=4:Y1=38:FO
      RN=1TO37:READX,Y,T:&LX1
      ,Y1,X,Y,T:X1=X:Y1=Y:NEX
      T
PQ 320 FORN1=1TO9:FORN=2TO15:P
      OKE646,N:PRINTM9$;:NEXT
      :NEXT:PRINT:PRINTM8$
MD 330 GETK$:IFK$=""THEN330
KH 340 IFK$=CHR$(13)THENRUN
JP 350 &C0:END
MC 360 DATA10,8,1,12,32,1,18,6
      ,1,20,36,1
JK 370 DATA24,32,0,26,18,1,26,
      12,0,26,14,1
JJ 380 DATA28,38,0,32,16,1,34,
      30,1,38,10,1
CK 390 DATA38,32,0,40,20,1,40,
      14,0,40,16,1
JG 400 DATA42,38,0,46,8,1,50,3
      2,1,56,6,1
JX 410 DATA58,36,1,62,32,0,67,
      14,1,67,30,1
BR 420 DATA63,28,0,68,24,1,72,
      36,0,74,10,1
MG 430 DATA78,8,1,82,10,1,82,1
      8,1,80,22,1
QC 440 DATA73,24,1,90,38,0,90,
      36,1,90,34,0
QK 450 DATA92,10,1                G
```

RACE ACE

EDITOR'S CHOICE



The first leg of the race—a country road.

Put on your crash helmet, pull on your driving gloves, and strap yourself in—you're about to compete against the clock in a grueling, cross-country road race. To win, you must weave your red racecar through traffic in all kinds of road conditions. The sooner you finish, the more points you're awarded.

In *Race Ace*, the course begins on a winding, tree-bordered country road. From there, you move to a hot, arid desert where many a car has met its fate among the cactuses. Following another jaunt through the countryside, you enter a long, dark mountain tunnel. Once inside, your headlights turn on automatically, but it's still difficult to see. As you exit the tunnel, the bright sunshine and green grass are a welcome sight, but watch out because the course soon takes you through the frozen north.

Race against the clock in this fast-action, arcade-style game for the 64. Joystick required.

Mike Sedore

There, you have to negotiate a slick, icy path where braking and steering are equally treacherous. For the final leg of the course, you return to the familiar pastoral setting.

Difficult road conditions are not the only things you have to contend with in *Race Ace*. There are other drivers on the course, and unfortunately, they're not very courteous. These road hogs would just as soon knock you in the ditch as let you pass.

Getting Started

Race Ace is written entirely in machine language. To type it in, you'll need to use *MLX*, the machine language entry program found elsewhere in this issue. When *MLX* prompts you, respond with the values given below.

Starting address: 0801
Ending address: 1500

When you've finished typing, be sure to save a copy of the program before exiting *MLX*.

Although it's written in machine language, *Race Ace* loads and runs like a BASIC program. When you're ready to play the game, plug a joystick into port 2. Then load the program and type RUN.

Start Your Engines

In *Race Ace*, you must finish the seven legs of the racecourse before the bar timer at the bottom of the screen runs down. Beat the clock and you progress to the next level with an even faster timer.

To start your racer and begin the course, press the fire button. Pushing the joystick forward accelerates your car to a maximum speed of 120 mph. But don't overdo it. If you put the pedal to the metal, you could run into trouble because cornering and avoiding traffic require that you brake. To slow your car, pull back on the joystick. For quick stops, press the fire button; this activates your emergency braking system. To get back up to speed, push the joystick forward again.

The best way to negotiate the racecourse is to move around traffic at a high rate of speed. To steer, move the joystick either left or right. Be careful not to oversteer since the road is narrow.

Colliding with another vehicle or running off the road won't eliminate you from the race. However, it will result in a penalty: Valuable seconds will be removed from the timer. And this is important because the game ends when you run out of time.

The faster you advance through each level, the more points you accumulate. Finish a level before the time expires, and you're awarded bonus points. Rack up the best score of the day, and the program will immortalize you as the Race Ace.

Race Ace

```
0801:1B 08 00 00 9E 32 30 37 F5
0809:37 20 20 42 59 20 4D 49 14
0811:4B 45 20 53 45 44 4F 52 7D
0819:45 00 00 00 4C CA 0A 00 6D
0821:A0 F4 F4 F5 E1 76 6A 6A E4
0829:20 74 74 75 61 F6 EA EA F3
0831:30 36 30 00 00 74 74 54 FB
0839:47 42 48 59 6A 00 00 00 6F
0841:3C 00 00 FF 00 03 D7 C0 EB
0849:07 7D D0 07 7D D0 07 7D 81
0851:D0 03 7D C0 03 7D C0 03 D8
0859:AA C0 01 FF 40 01 FF 40 55
0861:01 FF 40 03 AA C0 07 AA 3B
0869:D0 07 7D D0 07 7D D0 01 31
0871:55 40 03 FF C0 00 00 00 A2
0879:00 00 00 00 00 00 2C 07 E8
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08D9:AA 40 01 AA 40 01 AA 40 B5
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Race Ace

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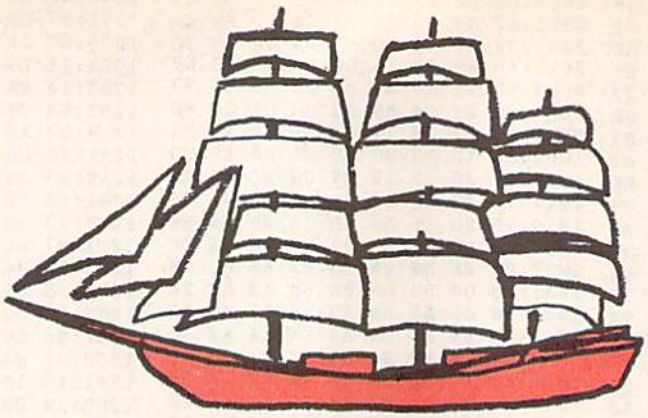


ISOLATION

John Dearden

COMMAND A NINETEENTH-CENTURY CLIPPER IN THIS INTENSE NAVAL STRATEGY GAME FOR THE 64. JOYSTICK(S) REQUIRED.

Your country is at war, and you've been stationed in the Blue Bottom Bay. This bay contains a strategic port that houses valuable munitions supplied by Allied cargo ships. Since the fate of your country depends on the free passage of these ships, the Navy has ordered you to protect the bay from enemy intruders.

The payload carried by the cargo ships is quite volatile, so you can't fire directly at intruding vessels without risk of destroying your own ships. Instead, you must capture the area surrounding the intruder and thus cut off any escape routes.

Getting Started

Isolation is written entirely in BASIC. To ensure accurate typing, use *The Automatic Proofreader*, found elsewhere in this issue, to enter it. When you've finished typing, be sure to save a copy of the program before you run it.

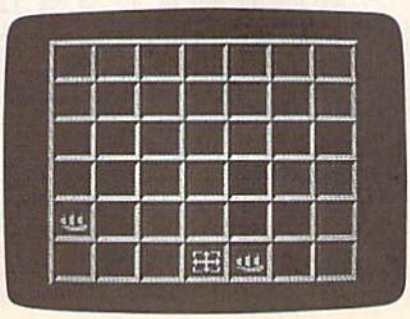
To play a game, plug a joystick into each port; then load and run the program. When the title screen appears, you're prompted for the number of players. Enter a number from 1 to 4. If you choose the one-player option, you play head-to-head with the computer, using the joystick in port 1.

After you've selected the number of players, the battlefield appears. It consists of a 7 × 6 grid of light-blue squares with four dark-blue starting squares. Player 1 controls the yellow ship; Player 2, the light-green ship; Player 3, the cyan ship; and Player 4, the gray ship. In the one-player game, you control the yellow ship and the computer controls the light-green ship.

Playing the Game

Players take turns firing volleys at the squares adjacent to their opponent's ship. When a square has been hit, a ship can no longer travel over it. As the game progresses, fewer squares are available for each ship to move to. When a player's ship is completely surrounded by enemy fire—no adjacent squares are available—the ship surrenders and is removed from the board. Gameplay continues until only one player remains.

Each player's turn has two parts. The first part involves moving the ship. Players 1 and 4 share the joystick in port 1, while players 2 and 3 use the joystick in port 2. When it's your turn to move, your ship will flash repeatedly. To move, simply push the joystick in the direction you want your ship to go. You can move to any square adjacent to the one your ship currently occupies.



The second part of the turn involves firing a volley at a grid square in an attempt to isolate your opponent(s). A large white cursor appears in your starting square after you've moved your ship. Guide this cursor to the target square and then press the fire button. The light-blue square will disappear with an explosion and reveal an empty black square.

If you select a square that is already black, a square that is occupied by an opponent, or a starting square, a buzzer will signal a bad selection and you'll be returned to your starting square for another try.

When the contest is over, the winner is rewarded with a victory anthem. Press any key to return to the title screen and to start another game.

Strategy

After you've played *Isolation* for a while, you'll develop your own winning strategies. In the meantime, here are some tips that will help you get started.

Diagonal movement is very important in *Isolation*. A diagonal move will sometimes allow you to get out of a sticky situation.

Pay close attention to the dark-blue squares on the board. Because they're indestructible, they represent an excellent place to take refuge.

You can block your opponent with your own ship. If the enemy has only two squares to move onto, it may be possible to move your ship onto one and punch out the other one.

Isolation

```
XQ 5 REM COPYRIGHT 1990 COMPUT
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     LL RIGHTS RESERVED
SM 10 GOTO 1110
BG 20 J=PEEK(56321+(P=2ORP=3))
     AND15
HA 30 IFQ=.THENIF(PEEK(56321+(
     P=2ORP=3))AND16)=.THENRE
     TURN
AD 40 IFQTHENR=-(R=.):IFRTHENO
     =B*32+31:Z=O+O*(Z=O):POK
     EV+P*2+1,Z
GF 50 U=((JAND4)=.)-((JAND8)=.
     ):H=((JAND1)=.)-((JAND2)
     =.)
ER 60 IFU=.THENIFH=.GOTO20
SR 70 X=X+U:Y=Y+H:IFX<1ORX>7TH
     ENX=-6*(X>7)+1:U=.
KC 80 IFY<1ORY>6THENY=-5*(Y>6)
     +1:H=.
XS 90 IFQTHENRETURN
JA 100 POKEV+21,PEEK(V+21)AND2
     54
MA 110 IFX>6THENPOKEV+16,PEEK(
     V+16)OR1:POKEV,316-X*40
     :GOTO130
DP 120 POKE V+16,PEEK(V+16)AND
     254:POKEV,X*40+12
KS 130 POKEV+1,Y*32+30:POKE V+
     21,PEEK(V+21)OR1:GOTO20
GJ 140 GOSUB 160
KF 150 FORZ=1TO12:POKES+24,.:F
     ORZZ=1TO3:NEXT:POKES+24
     ,15:NEXT:RETURN
PQ 160 FORZ=.TO23:POKES+Z,.:NE
     XT:RETURN
GP 170 P=P+1:IFP>CTHENP=1
HS 180 IFW=C-1GOTO 1050
AC 190 IFLX(P)=9GOTO170
RX 200 X=LX(P):Y=LY(P):IFP=2AN
     DCP=1GOTO310
RE 210 Q=1:A=X:B=Y
AB 220 X=A:Y=B:GOSUB20:IFX=AAN
     DY=BGOTO220
PH 230 IFS(Y,X)=.GOTO220
BG 240 IFP(Y,X)>.GOTO220
XH 250 IFX=.ORX=8ORY=.ORY=7GOT
     O220
RE 260 GOTO610
FS 270 E=1:XS=X:YS=Y:IF(XS=2OR
     XS=6)THENIF(YS=2ORYS=5)
     THENE=.:RETURN
BF 280 E=1:IFXS<1ORXS>7ORYS<1O
     RYS>6THENE=.:RETURN
AH 290 IFS(YS,XS)=.ORP(YS,XS)>
     .THENE=.
HJ 300 RETURN
CX 310 TR=.
BE 320 TR=TR+1:AT=.:IFTR=5GOTO
     540
EP 330 AT=AT+1:IFAT=20GOTO320
QF 340 XP=X+INT(RND(1)*3)-1:IF
     XP=XTHENIF(TR=1ORTR=3)G
     OTO330
DP 350 YP=Y+INT(RND(1)*3)-1:IF
     YP=YTHENIF(TR=1ORTR=3)G
     OTO330
KQ 360 IFYP<>YTHENIFXP<>XTHENI
     F(TRY=2ORTRY=4)GOTO 330
CR 370 IFXP<1ORXP>7ORYP<1ORYP>
     6GOTO330
BS 380 IFS(YP,XP)=.ORP(YP,XP)>
     .GOTO330
DC 390 IFTR>2GOTO600
FP 400 SX=XP-X:SY=YP-Y:IFTR=2G
     OTO470
HJ 410 XS=X+2*SX:YS=Y+2*SY:GOS
     UB280:IFEGOTO600
QC 420 XS=X+SX:YS=Y+2*SY:GOSUB
     280:IFEGOTO600
CB 430 XS=X+2*SX:YS=Y+SY:GOSUB
     280:IFEGOTO600
AK 440 XS=X+2*SX:YS=Y+1*SY:GOS
     UB280:IFEGOTO600
SH 450 XS=X+1*SX:YS=Y+2*SY:GOS
     UB280:IFEGOTO600
JA 460 GOTO 330
HM 470 YS=Y+2*SY:XS=X-1:GOSUB2
     80:IFEGOTO600
BX 480 XS=X:GOSUB280:IFEGOTO60
     0
AG 490 XS=X+1:GOSUB280:IFEGOTO
     600
PE 500 XS=X+2*XS:YS=Y-1:GOSUB2
     80:IFEGOTO600
RQ 510 YS=Y:GOSUB280:IFEGOTO60
     0
QF 520 YS=Y+1:GOSUB280:IFEGOTO
     600
HE 530 GOTO330
GE 540 Z=-2
SP 550 Z=Z+1:XS=X+Z:YS=Y-1:GOS
     UB280:IFEGOTO590
XG 560 YS=Y:IFZTHENGOSUB280:IF
     EGOTO590
JD 570 YS=Y+1:GOSUB280:IFEGOTO
     590
KM 580 GOTO550
DS 590 XP=XS:YP=YS
EC 600 A=X:B=Y:U=XP-X:H=YP-Y:X
     =XP:Y=YP
EB 610 FORZ=1TO8:O=A*40+12+Z*5
     *U:ON-(O>255)GOTO630
FC 620 POKEV+16,PEEK(V+16)AND2
     55-2*(INT(P*P/2)-(P=1))
     :POKEV+P*2,O:GOTO640
JM 630 POKEV+16,PEEK(V+16)OR2*
     (INT(P*P/2)-(P=1)):POKE
     V+P*2,O-256
SD 640 O=B*32+31+Z*4*H:POKEV+P
     *2+1,O:NEXT
JS 650 LX(P)=X:LY(P)=Y:P(B,A)=
     .:P(Y,X)=P
GQ 660 IFP=2ANDCP=1GOTO780
QG 670 POKE V+21,PEEK(V+21)AND
     254:POKEV+16,PEEK(V+16)
     AND254
PH 680 ONPGOTO690,700,710,720
PJ 690 X=2:Y=2:POKEV,92:POKEV+
     1,94:GOTO730
RC 700 X=6:Y=5:POKEV+1,190:POK
     EV,252:GOTO730
BK 710 X=6:Y=2:POKEV+1,94:POKE
     V,252:GOTO730
CS 720 X=2:Y=5:POKEV,92:POKEV+
     1,190
EB 730 POKEV+21,31
KG 740 Q=.:GOSUB20:POKEV+1,.:I
     FP(Y,X)THENGOSUB140:GOT
     O670
KK 750 IFS(Y,X)=.THENGOSUB140:
     GOTO670
QE 760 IF(X=2ORX=6)THENIF(Y=2O
     RY=5)THENGOSUB140:GOTO6
     70
HJ 770 GOTO 880
HX 780 Z=.
SE 790 Z=Z+1:IFZ>8GOTO840
GJ 800 X=LX(1)+CX(Z):IFLX(1)>4
     THENX=LX(1)+CX(Z)*-1
KA 810 Y=LY(1)+CY(Z):IFLY(1)>3
     THENY=LY(1)+CY(Z)*-1
JG 820 GOSUB270:IFEGOTO880
RR 830 GOTO790
MG 840 Y=1:X=.
BS 850 X=X+1:IFX>7THENX=.:Y=Y+
     1
JB 860 GOSUB270:IFEGOTO880
BX 870 GOTO850
DH 880 POKES+3,8:POKES+6,240:P
     OKES+5,10:POKES+1,70:PO
     KES+4,129:PS=52102+X*5+
     Y*160
EK 890 FORZ=.TO2:O=PS+Z*40:POK
     EO,224:POKEO+1,224:POKE
     O+2,224:POKEO+3,224:NEX
     T
JK 900 S(Y,X)=.:FORZ=15TO.STEP
     -.2:POKES+24,Z:NEXT
SA 910 FORZ=1TOC:IFZ=PGOTO940
PE 920 IFLX(Z)=9THENGOTO940
DS 930 GOSUB 950
DG 940 NEXT:Z=P:GOSUB950:GOTO1
     70
MD 950 X=LX(Z):Y=LY(Z):IFS(Y+1
     ,X)ANDP(Y+1,X)=.GOTO104
     0
HA 960 IFS(Y-1,X)THENIFP(Y-1,X
     )=.GOTO1040
JH 970 IFS(Y,X+1)THENIFP(Y,X+1
     )=.GOTO1040
HJ 980 IFS(Y,X-1)THENIFP(Y,X-1
     )=.GOTO1040
AP 990 IFS(Y+1,X+1)THENIFP(Y+1
     ,X+1)=.GOTO1040
FH 1000 IFS(Y+1,X-1)THENIFP(Y+
     1,X-1)=.GOTO1040
AH 1010 IFS(Y-1,X+1)THENIFP(Y-
     1,X+1)=.GOTO1040
ER 1020 IFS(Y-1,X-1)THENIFP(Y-
     1,X-1)=.GOTO1040
RR 1030 W=W+1:POKEV+Z*2+1,.:P(
     Y,X)=.:LX(Z)=9
DA 1040 RETURN
XJ 1050 GOSUB 160:N$="#4EUEU":
     D$="***&*#"
XX 1060 POKES+5,13:POKES+12,9:
     POKES+24,15:FORZ=1TO6:
     N=ASC(MID$(N$,Z,1))+15
BG 1070 D=ASC(MID$(D$,Z,1))-34
     :POKES+1,N:POKES+8,N/2
     :POKES+4,17:POKES+11,3
     3
RR 1080 FORW=1TO800/D:NEXT:POK
     ES+4,16:POKES+11,32:NE
     XT:POKES+24,.
RK 1090 POKE198,.:WAIT198,1:PO
     KEV+21,.:PRINT"{CLR}":
     POKE53281,.
FQ 1100 POKE53265,PEEK(53265)A
     ND191:GOTO1360
FJ 1110 PRINT"{CLR}"CHR$(142)C
     HR$(8)
SS 1120 POKE88,.:POKE89,232:PO
     KE90,.:POKE91,216:POKE
     781,9:POKE782,1:POKE56
     333,127
BP 1130 POKE1,51:SYS41964:POKE
     1,55:POKE56333,129:POK
     E56578,PEEK(56578)OR3
MC 1140 POKE56576,PEEK(56576)A
     ND252:POKE53272,(PEEK(
     53272)AND63)OR48:POKE6
     48,204
DF 1150 POKE53272,(PEEK(53272)
     AND240)OR8:PRINT"{CLR}
     ":POKE 53280,6
RK 1160 POKE53281,.:POKE 53282
     ,1:POKE 53283,14:POKE
     {SPACE}53284,.:Z=RND(-
     TI)
HJ 1170 PRINTTAB(11)"{GRN}ONE
     {SPACE}MOMENT PLEASE"
BP 1180 DATA0,44,0,0,12,44,44,
     28,12,12,92,28,28,92,9
     2,92,92,92
KD 1190 DATA92,92,92,92,92,92,
     92,92,92,28,92,28,12,2
     8,42,170,12,170
SJ 1200 DATA42,170,170,10,170,
     168,2,170,168,255,24,2
     55,192,60,3,192,126,3
AB 1210 DATA192,24,3,0,24,0,32
     ,24,4,96,24,6,255,255,
     255,255,255,255,96,24,
     6
AH 1220 DATA32,24,4,0,24,0,192
```

```
         ,24,3,192,126,3,192,60
         ,3,255,24,255
EK 1230  FORZ=.TO44:READA:POKE5
         9392+Z,A:NEXT:FORZ=45T
         062:POKE59392+Z,.:NEXT
GP 1240  FORZ=.TO47:READA:POKE5
         9456+Z,A:NEXT:FORZ=48T
         062:POKE59456+Z,.:NEXT
AQ 1250  V=53248:S=54272:GOSUB1
         60
MD 1260  POKE53240,161:POKE5324
         1,160:POKE53242,160:PO
         KE53243,160:POKE53244,
         160
AX 1270  POKEV+39,1:POKEV+40,7:
         POKEV+41,13:POKEV+42,3
         :POKEV+43,15
XS 1280  POKEV+28,30:POKEV+37,1
         :POKEV+38,11
HK 1290  FORZ=.TO39:READA:POKE5
         7560+Z,A:NEXT:FORZ=.TO
         47:READA:POKE57680+Z,A
         :NEXT
ME 1300  FORZ=1TO8:READX:CX(Z)=
         X:NEXT:FORZ=1TO8:READY
         :CY(Z)=Y:NEXT
RA 1310  DATA15,15,15,15,15,15,
         15,15,15,14,12,8,15,15
         ,15,15,0,0,0,0,255,239
         ,207,143
BS 1320  DATA0,0,0,0,255,255,25
         5,255,15,15,15,15,255,
         239,207,143,15,14,12,8
         ,255,239
JM 1330  DATA207,143,15,14,12,8
         ,255,255,255,255,0,0,0
         ,0,15,15,15,15,1,3,7,1
         5,255
XD 1340  DATA239,207,143,15,15,
         15,15,255,255,255,255,
         15,14,12,8,31,63,127,2
         55
AH 1350  DATA1,1,0,1,-1,0,-1,-1
         ,1,0,1,-1,1,-1,0,-1
BD 1360  FORY=1TO6:FORX=1TO7:P(
         Y,X)=.:S(Y,X)=1:NEXT:N
         EXT:LX(1)=2:LY(1)=2:LX
         (2)=6
EA 1370  LY(2)=5:LX(3)=6:LY(3)=
         2:LX(4)=2:LY(4)=5:P=.:
         W=.:CP=.
PS 1380  POKE53265,PEEK(53265)A
         ND191:PRINT"{CLR}{WHT}
         {4 DOWN}":PRINTTAB(10)
         "{R}"
QA 1390  PRINTTAB(10)"B
         {6 SPACES}B{2 SPACES}C
         +C":PRINTTAB(10)"{8}BU
         CIUCIBUC{S}B{BLU}Q{8}U
         CI{R}CI"
FK 1400  PRINTTAB(10)"{5}BJCIB
         {SPACE}BBB BBBB BB B":
         PRINTTAB(10)"{4}{E}JCK
         JCKJJCJJJJCK{E} JK"
KS 1410  PRINTTAB(7)"{RED}
         {26 @}"
CA 1420  PRINT"{DOWN}"TAB(7)"
         {YEL}HOW MANY PLAYERS?
          (1 TO 4)"
DX 1430  PRINTTAB(7)"{RED}
         {26 @}{5 DOWN}"
XK 1440  PRINTTAB(12)"{5}COPYRI
         GHT 1990":PRINTTAB(7)"
         COMPUTE! PUBLICATIONS
         {SPACE}INC"
SG 1450  PRINTTAB(10)"ALL RIGHT
         S RESERVED"
CC 1460  POKE198,.:WAIT198,1:GE
         TK$:C=VAL(K$):IFC<1ORC
         >4GOTO1460
MM 1470  P(2,2)=1:P(5,6)=2:IFC>
         2THENP(2,6)=3
RP 1480  IFC>3THENP(5,2)=4
MH 1490  IFC=1THENCP=1:C=2
PH 1500  PRINT"{CLR}{4}";:POKE5
         3281,6:POKE53265,PEEK(
         53265)OR64:FORZ=1TO6
PJ 1510  PRINT"{2 SPACES}{-}┬┬┬┬
         ┬{N}┬┬┬┬{N}┬┬┬┬{N}┬┬┬┬
         {N}┬┬┬┬{N}┬┬┬┬{N}┬┬┬┬
         {*}"
CM 1520  FORJ=1TO3:PRINT"
         {2 SPACES}+{RVS}
         {4 SPACES}{OFF}+{RVS}
         {4 SPACES}{OFF}+{RVS}
         {4 SPACES}{OFF}+{RVS}
         {4 SPACES}{OFF}+{RVS}
         {4 SPACES}{OFF}+{RVS}
         {4 SPACES}{OFF}+{RVS}
         {4 SPACES}{OFF}+":NEXT
QA 1530  NEXT:PRINT"{2 SPACES}
         {P}┬┬┬┬{Q}┬┬┬┬{Q}┬┬┬┬
         {Q}┬┬┬┬{Q}┬┬┬┬{Q}┬┬┬┬
         {Q}┬┬┬┬{S}{HOME}";
AC 1540  PRINT"{2 SPACES}{D}┬┬┬┬
         ┬-┬┬┬┬-┬┬┬┬-┬┬┬┬-┬┬┬┬-
         ┬┬┬┬-┬┬┬┬{Z}{4 DOWN}":
         FORZ=1TO3
FS 1550  PRINTTAB(8)"{4 SPACES}
         "TAB(28)"{4 SPACES}":N
         EXT:PRINT"{8 DOWN}":FO
         RZ=1TO3
HS 1560  PRINTTAB(8)"{4 SPACES}
         "TAB(28)"{4 SPACES}":N
         EXT
BB 1570  POKEV+1,.:POKEV+7,.:PO
         KEV+9,.:POKEV+2,92:POK
         EV+3,95:POKEV+4,252
MA 1580  POKEV+5,191:IFC>2THENP
         OKEV+6,252:POKEV+7,95
RE 1590  IFC>3THENPOKEV+8,92:PO
         KEV+9,191
PH 1600  POKEV+21,31:GOTO170
```

G

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- Updates — Approximately every 6 weeks we release an update of our software that includes new utilities, copiers, and settings. ALL updates are $5.00... which we feel is a very reasonable fee. Updates are NOT required.
- Across the nation, software rental stores use **SUPER-CARD+** to backup their originals. Our **SUPER-CARD+** has been tested in Europe and has been chosen as the BEST backup utility!
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So, the facts are on the table . . . you decide for yourself. By the way, they say that *"imitation is the highest form of flattery"* . . . thanks guys!

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Circle Reader Service Number 139

This clever utility for the 64 enables you to compress machine language programs by as much 75 percent. Furthermore, the resulting files are executable—that is, they automatically decompress when you run them.

Indi Phillips

Most computer owners prefer to keep their most heavily used programs on a couple of disks where they can be found easily. The trouble with this approach is that the size of a program often expands exponentially with its usefulness. Consequently, it's virtually impossible to squeeze your favorites onto one or two disks.

This ingenious utility can eliminate this problem by compressing most machine language (ML) programs by 30–60 percent and some programs by as much as 75 percent. And, because the files created by *MegaSqueeze* load and run like BASIC programs, you won't have to remember starting addresses.

Getting Started

MegaSqueeze is written entirely in machine language, so you'll need to use *MLX*, the machine language entry program located elsewhere in this issue, to type it in. The *MLX* prompts, and the values you should enter, are as follows:

Starting address: 0801
Ending address: 1418

When you've finished typing in the data for *MegaSqueeze*, be sure to save a copy of the program to disk.

Although written in machine language, *MegaSqueeze* loads and runs like a BASIC program. So, to get started, type LOAD *"filename"*,8, where *filename* is the name you used when you saved *MegaSqueeze*. Once the file has loaded, type RUN.

Compressing Files

The program's main screen contains several prompts for information about your program. The first prompt requests the name of the source file. Type the name of the file containing the ML program to be compressed and press RETURN. The second prompt asks for the name of the destination, or output, file. Type the filename that you want to use for the compressed file.

The third prompt requests the SYS address of the ML program. Enter the SYS address (in hexadecimal) that you normally use to execute the program. To convert the SYS address to hexadecimal, you can use a calculator that can handle hexadecimal-to-decimal conversions (usually called a programmer's calculator) or the following short program.

```
KQ 10 H$="0123456789ABCDEF":B=
      16:B1=2↑B:REM B IS NUMBE
      R OF BITS
GC 20 PRINT"CONVERT A DECIMAL
      {SPACE}NUMBER INTO":PRIN
      T"ITS HEXADECIMAL EQUIVA
      LENT"
```

```
KX 30 INPUT"ENTER DECIMAL VALU
      E";N:IFABS(N)>B1-1THEN30
XE 40 N$="":IFN<0THENN=B1+N
AK 50 FORI=1TOB/4:T=N-(INT(N/1
      6)*16):N$=MID$(H$,T+1,1)
      +N$:N=N/16:NEXTI:PRINTN$
```

The final prompt asks for the $0001 value. The default value of 37 works very well for most files. You can try other values to see how they affect the compression ratios for various files.

Once you've answered the main prompts, *MegaSqueeze* asks whether you want the screen to blank while it compresses the file. Compressing with the screen on allows you to monitor the program's progress, but it takes about 15 percent longer than when the screen is blanked.

Next, *MegaSqueeze* requests that you enter a compression speed from 1 to 6, where 1 is the fastest and 6 is the slowest. The speed value actually determines the method used to compress the source file. The more effective methods can produce dramatic reductions in the size of your file, but they take much longer to compress and decompress. In general, the following guidelines should be used for selecting the compression speed.

File Size (Blocks)	Compression Speed
1–30	1
30–75	2
75–120	3
120–160	4
160–200	5
200+	6

After you've selected the compression speed, *MegaSqueeze* prompts you to place the disk containing the source file in drive 8. Press the space bar after you've placed the disk in the drive and closed the door. If you've chosen to leave the screen on, you'll see counters indicating how many bytes of the source file have been processed, how many bytes they've produced in the compressed file, and how many bytes have been saved by the compression.

When *MegaSqueeze* finishes compressing the file, the program prompts you to place the destination disk in the disk drive. Press the space bar when the disk is in the drive and ready to be written to. Once the file is saved, *MegaSqueeze* asks if you'd like another copy. To write another copy of the file, place another disk in drive 8 and type *Y*. Type *N* to run the compressed program.

Compression Tips

You might think that you should use the optimal compression method (speed 6) on all of your files, but this isn't the case. The better compression methods generally require more overhead and are therefore less effective on smaller files. You should also keep in mind that these compression methods take longer to decompress. If you're going to be running a particular program fairly often, you may want to use a less effective but faster compression method.

MegaSqueeze can only compress ML programs. However, some ML programs load and run like BASIC programs. To determine the SYS address for this type of program, you'll have to load and list the program in question. You should see a line similar to the following near the beginning of the file (or it may be the only line in the file).

```
10 SYS 2061
```

The address following the SYS command is the one you should give *MegaSqueeze* (after you've converted it to hexadecimal).

Some ML programs won't run correctly after they've been compressed. Programs that require initialization from a BASIC program and those that reside under ROM seem to cause the most difficulty. You'll just have to try each program individually to determine whether or not it can be compressed.

MegaSqueeze

```
0801:0B 08 70 17 9E 32 34 30 6E
0809:37 00 00 00 20 20 20 20 96
0811:20 20 20 20 20 A0 C4 B9 06
0819:3C 08 99 F8 00 B9 FD 08 F6
0821:99 33 03 88 D0 F1 A0 09 4C
0829:B9 0C 08 99 FF 03 88 D0 A1
0831:F7 A9 08 85 2D A9 1C 85 CE
0839:2E 4C 00 01 0D E3 01 08 85
0841:1C 8B 12 B9 6E 09 99 E8 D3
0849:07 C8 D0 F7 EE 02 01 EE 19
0851:05 01 C6 F9 D0 ED A2 03 23
0859:20 34 03 F0 33 C9 07 D0 95
0861:16 A2 01 20 34 03 D0 0A A0
0869:A2 04 20 34 03 18 69 07 65
0871:10 05 A2 0A 20 34 03 85 1D
0879:A8 A5 A7 85 A9 A5 FE 85 FB
0881:F7 A5 FF 85 F8 20 6C 03 73
0889:A5 F8 85 FF A5 F7 85 FE 72
0891:E8 20 34 03 D0 1E A2 08 21
0899:20 34 03 A0 02 84 A8 85 2A
08A1:A6 18 A5 FC 65 A6 85 F7 58
08A9:A5 FD 65 A7 85 F8 20 6C EF
08B1:03 4C 13 01 E8 20 34 03 FB
08B9:D0 1C A0 03 84 A8 E8 20 36
08C1:34 03 F0 08 A2 08 20 34 F4
08C9:03 4C 5C 01 A2 0B 20 34 BF
08D1:03 E6 A7 4C 5C 01 E8 20 AF
08D9:34 03 D0 0A E8 20 34 03 B2
08E1:18 69 04 A8 D0 D6 E8 20 37
08E9:34 03 D0 0A A2 02 20 34 21
08F1:03 18 69 06 D0 ED A2 08 A2
08F9:20 34 03 D0 E6 A9 00 85 F7
0901:A7 A4 FB F0 0C 06 FA 2A 37
0909:26 A7 C6 FB CA D0 F2 A8 D8
0911:60 48 B1 FE 85 FA A9 08 FE
0919:85 FB 68 A4 FE D0 02 C6 4A
0921:FF C6 FE C0 E7 D0 DE A4 B5
0929:FF C0 07 D0 D8 A9 37 85 BA
0931:01 58 4C 00 1C A4 A8 F0 19
0939:22 A5 F7 38 E5 A8 B0 03 7E
0941:C6 F8 38 85 F7 A5 FC E5 8A
0949:A8 B0 02 C6 FD 85 FC B1 3A
0951:F7 88 91 FC 98 D0 F8 C4 42
0959:A9 F0 0A B1 F7 C6 FD C6 76
0961:F8 C6 A9 10 EC 60 78 E6 98
0969:01 4C 16 08 60 00 0D 08 77
0971:0A 00 9E 20 37 31 36 E3 2D
0979:14 27 60 84 8D 86 85 33 78
0981:22 62 0C 8D 21 D0 A9 28 5F
0989:A0 08 38 5C 1C 4C AA 08 2A
0991:13 11 11 8E 4D 45 47 41 CB
0999:24 B7 51 11 38 45 5A AA 1D
09A1:99 43 4F 4D 50 D3 29 4F 83
09A9:52 08 4F 23 43 E1 C2 A3 CD
09B1:20 0E 60 60 0C 8D 48 48 D8
09B9:06 2C E0 46 49 4C 5B 05 91
09C1:01 91 44 73 01 03 4E 41 6A
09C9:54 49 4F 4E 3C 3A 20 10 42
09D1:53 59 D5 41 44 44 52 45 CF
09D9:53 53 01 70 88 8D C6 07 A0
09E1:96 83 31 20 56 41 4C 55 ED
09E9:45 20 3A 24 00 A9 42 CD 29
09F1:7F E3 06 F9 DD 11 A2 20 B5
09F9:A0 60 FD 2D 1A 85 B7 AB 09
0A01:D4 07 26 35 20 00 EB 64 96
0A09:50 68 D4 72 18 E6 10 28 C5
0A11:08 20 72 9E A9 9D AA BA 3D
0A19:8D 2C 09 38 E9 B6 52 41 B3
0A21:0A 8E 1E 09 8C 22 72 B5 B9
0A29:8D 1A 01 F0 29 00 CC 85 22
0A31:C6 A5 C6 F0 FC AD C2 70 8E
0A39:0E C9 0D F0 42 C9 14 F0 C9
0A41:20 C9 20 30 E7 C9 60 10 16
0A49:E3 EE EA 02 40 91 11 D0 C3
0A51:07 AE 77 02 E0 14 D0 CF 6C
0A59:20 C9 55 00 22 AE C7 E0 D6
0A61:00 80 20 CE 24 20 D3 08 D7
0A69:C1 1A 00 1A 83 C9 10 F0 DA
0A71:06 D2 A1 4C 08 09 63 1E 7F
0A79:CC A9 20 4C D2 8B 20 62 8E
0A81:4E 0C A9 35 8D 18 09 10 37
0A89:38 44 08 03 B1 05 03 31 D4
0A91:A0 10 A2 09 18 EF 3F A9 87
0A99:03 A2 30 A0 47 20 EE 19 99
0AA1:EE 07 00 1C 89 A8 7A 24 B8
0AA9:E2 E8 28 6D 26 1F 64 22 DD
0AB1:9D B8 8B B8 10 D0 EF 4C AF
0AB9:E5 09 BD 51 E1 12 1F 85 EA
0AC1:02 BD 50 05 C9 07 10 02 2D
0AC9:09 40 29 4F C9 0B 30 02 69
0AD1:E9 37 9E 3D 0A 0A 05 02 D4
0AD9:60 D8 80 F7 E0 20 35 E7 BD
0AE1:02 40 0E 34 13 A2 28 32 B1
0AE9:67 09 8D 2F 13 4C 30 16 D8
0AF1:A9 11 A0 8C 3B 1E AB 91 37
0AF9:4E E4 F0 17 0D 0D 14 12 D4
0B01:10 84 53 4F 55 52 43 45 5F
0B09:BA DD 92 8D 8E 78 FC 20 8F
0B11:0E 01 01 10 A5 B7 A0 02 DE
0B19:A2 A8 20 BD FF 89 4B A6 ED
0B21:85 AE A5 90 4A 4A 78 03 D2
0B29:C3 61 85 AF 20 33 F6 BB 9C
0B31:4A 00 16 EA 6E 4B 18 AD 5C
0B39:BA 05 C4 0D 20 55 C6 BD F8
0B41:C8 16 9D C8 02 66 38 15 B0
0B49:27 38 0B EA 71 09 8C 8F 69
0B51:81 84 89 8E 87 05 EF 32 C5
0B59:01 31 E2 01 2D 10 0F DF 50
0B61:60 D0 02 0E 4E 10 86 C3 80
0B69:84 C4 B0 A0 C0 40 05 38 5C
0B71:A9 60 7C A8 A0 09 07 15 DA
0B79:C7 38 21 20 50 08 20 13 9D
0B81:EE A0 00 A8 2B 91 AE 28 E6
0B89:57 E6 AE 68 79 87 AF 24 CE
0B91:90 50 E7 20 EF ED 20 42 BC
0B99:F6 90 05 E6 05 20 E2 DE AB
0BA1:78 48 72 4C 80 08 BC D6 8D
0BA9:B0 0A 50 AD BD 26 0C 9D BB
0BB1:34 03 A1 15 E6 E0 C3 D0 3B
0BB9:E9 BD 00 15 9D E1 07 A0 A8
0BC1:55 86 FA 4C 00 08 00 20 88
0BC9:48 1A 4C 10 92 AB D0 C8 C2
0BD1:A0 8F 8C 84 93 61 30 30 A8
0BD9:30 8F 8E 85 97 C1 14 EA EC
0BE1:20 A0 AB BA FC 24 30 31 5B
0BE9:36 34 D2 83 AA B0 B4 BD F9
0BF1:A9 2E 82 8C 81 8E 8B 5F 3E
0BF9:08 40 85 8E A0 A8 89 8E 07
0C01:83 92 85 81 93 85 A0 93 CF
0C09:90 85 85 84 A9 A0 68 7B DF
0C11:48 BA BF A0 20 20 59 C4 F6
0C19:29 A9 A9 00 8D 20 FA 7A C2
0C21:83 04 78 A2 FF 9A 20 A3 83
```

```
0C29:68 01 15 FD 20 5E FF 20 D2
0C31:53 E4 20 BF E3 58 AD 01 09
0C39:DC C9 EF D0 F9 4C C8 02 D1
0C41:EF A7 B7 A2 B8 86 BB A2 56
0C49:01 A0 08 86 AC 84 AD A6 EC
0C51:2D A4 2E A0 FA 59 86 AA ED
0C59:89 70 20 BA FF AD 4D DE 32
0C61:C9 89 F0 4F A9 61 85 30 E1
0C69:4F D5 F3 A0 99 39 6E 0A BF
0C71:71 A9 01 22 28 C4 21 22 A7
0C79:D1 FC B0 12 78 84 01 B1 7A
0C81:AC A2 37 86 01 58 20 DD 6F
0C89:A7 67 DB FC D0 E9 20 45 4E
0C91:24 B9 30 11 A5 BA 20 0C A5
0C99:ED A5 B9 29 EF 09 E0 20 61
0CA1:B9 ED 20 FE ED 18 90 16 0D
0CA9:A9 AC A6 AE A4 AF 86 AE 21
0CB1:84 AF AA B5 00 85 C1 B5 F7
0CB9:01 85 C2 20 2E DE 58 4C F7
0CC1:2D 63 F8 9D D3 C1 1D 1C 3E
0CC9:78 A9 35 3F 04 F8 9C C6 27
0CD1:6B A2 19 B0 5E 0F 95 40 11
0CD9:CA 10 F8 79 AA 4C F4 09 8B
0CE1:AD 2C 80 5F 8D 6C 0F 90 AE
0CE9:03 EE 6A 0F 4C 1A 08 92 EA
0CF1:BC FD 5C 0A D0 E4 FC C9 F1
0CF9:FF F0 05 65 40 64 CC 91 04
0D01:A9 50 8D D0 5C 12 C0 0A 79
0D09:93 04 A9 60 8D BF 0B A9 54
0D11:37 08 1E 16 40 08 CA F7 9D
0D19:C9 08 F0 06 5E 47 01 C7 72
0D21:43 B1 38 E5 F7 8D 3F A9 CC
0D29:10 0D 8D 3E 26 B1 71 6C 6B
0D31:87 8D 42 3C 11 B0 80 0D D7
0D39:43 0E FA FE F0 10 FB 95 1D
0D41:4C 2E 38 E9 07 8D 3D 0E A9
0D49:A5 FA 85 2D EA A4 42 A6 8D
0D51:41 D0 01 88 CA AD 56 0E B0
0D59:AD 57 0E 51 83 1F 16 80 3C
0D61:F3 63 01 E8 E0 80 32 D8 43
0D69:84 92 31 7E 00 E6 FC 97 A5
0D71:7C FD 03 49 13 0F A0 0D 61
0D79:1C 10 85 11 A9 6E E2 5E 92
0D81:90 0F 85 FB CB 35 FC 93 D8
0D89:6B FD 46 3F 4C 16 6B 90 B7
0D91:1A D0 18 69 01 A8 E8 01 04
0D99:42 A2 00 3D 25 86 41 A9 C0
0DA1:01 85 03 A1 FC 4C 40 E3 95
0DA9:79 1B A9 04 85 A6 9E FF C0
0DB1:05 E5 24 07 A5 06 E5 FD CB
0DB9:85 08 A5 07 4F BC 79 08 26
0DC1:C6 07 EA A4 4F 03 B0 63 F3
0DC9:27 03 D0 53 15 C0 AD CC 5B
0DD1:0C 87 7D 1B E4 58 64 CC 53
0DD9:C2 C2 03 C9 04 90 0D 01 80
0DE1:31 E2 20 50 D2 6C 0D A0 59
0DE9:C7 02 D0 2A A5 08 C9 01 07
0DF1:B0 24 20 00 0C E0 F2 BB F6
0DF9:22 16 4C 10 5A C7 F1 F0 FB
0E01:F8 A8 F0 08 83 24 20 D0 20
0E09:09 E6 10 35 11 6A 42 3E AD
0E11:3C DE 00 84 10 84 11 C3 C3
0E19:EE 0A 03 85 FC 90 93 FD 37
0E21:4C 30 C4 98 37 66 0D C6 C5
0E29:F7 D0 10 BC 21 F7 A5 0D 84
0E31:A0 00 91 FA E6 FA D0 02 46
0E39:E6 FB 60 C6 73 07 D0 48 E1
0E41:84 41 A0 01 B1 FC D1 41 7A
0E49:D0 05 C8 C0 FF D0 F5 D3 37
0E51:65 3E C8 B2 36 FC 85 2A CE
0E59:05 FD D9 85 A8 A0 23 41 5A
0E61:B9 02 08 A0 17 01 23 D0 B9
0E69:E4 98 18 65 41 51 F0 07 AF
0E71:B0 69 00 90 05 88 F0 12 87
0E79:D0 EF 88 C4 03 90 0B C8 90
0E81:84 03 A5 41 85 05 A5 42 37
0E89:85 06 A4 41 A2 00 86 41 F5
0E91:68 00 C2 13 C1 2F ED 22 34
0E99:C1 26 1C 21 85 48 B0 12 76
0EA1:A9 AB 66 C4 A9 E5 A7 5E 29
0EA9:AA E5 A8 4C B5 0B A9 AD 49
0EB1:8D D5 05 38 A5 A7 E5 A9 6F
0EB9:AA A5 A8 E5 AA 04 77 50 AC
0EC1:D8 78 A9 34 85 01 4C 45 EE
0EC9:32 7C 21 18 A4 79 1E E1 EC
0ED1:D0 09 94 C9 07 B0 03 4C 15
0ED9:D2 0C 4C DD 4D 9C 0A 1C D6
0EE1:2A 3C 5A A0 51 11 07 C1 16
0EE9:86 40 D1 4A C2 05 1A DD 74
0EF1:E0 39 F7 57 F1 C6 08 10 0C
0EF9:0C 14 0A B1 00 0A 90 A2 69
0F01:0B 20 C0 0C B7 79 A3 52 C2
0F09:AC 46 08 66 07 9E 48 71 2B
0F11:88 86 0E 15 E0 A8 60 47 D9
0F19:21 17 A5 11 E9 00 B0 1F 23
0F21:83 3F 10 E9 07 85 10 A2 82
0F29:04 46 09 CF 88 F8 E7 29 1A
0F31:A2 87 05 18 F9 60 A2 0A 45
0F39:46 11 66 10 76 38 D3 F6 BF
0F41:0E 53 4C FD D6 D5 1C 09 F3
0F49:C9 0A B0 2C C9 06 B0 0E 7D
0F51:C2 1D 38 E9 04 4A B0 22 8A
0F59:23 23 38 07 E9 06 83 2C E3
0F61:80 60 63 62 18 C7 A2 A5 35
0F69:03 85 02 A2 08 46 02 1E 50
0F71:6E CA D0 F8 38 20 D0 0E 15
0F79:38 08 35 C0 44 03 0D 4C FC
0F81:31 0C 14 F7 C1 E1 A4 2E 4A
0F89:A5 01 0E 9D 01 08 D2 EE 13
0F91:89 88 EE 06 F3 09 01 A5 40
0F99:4A EC BD 50 70 16 1A F1 D6
0FA1:58 E6 01 90 D6 4C 75 5C FD
0FA9:41 5A 68 01 54 FE E8 10 9C
0FB1:1C 09 3C 82 83 4C 18 01 4E
0FB9:4C 67 09 1B 83 1A 21 70 E1
0FC1:81 8C 8C 60 A6 93 94 AE B6
0FC9:A0 84 89 93 8B 85 94 94 F3
0FD1:24 79 2F 35 0A 85 A0 81 C2
0FD9:87 81 89 8E 48 70 F9 A8 D6
0FE1:99 AF 8E A9 B1 DE 0B 08 4C
0FE9:70 17 9E 32 34 30 37 00 CD
0FF1:00 00 66 F9 40 46 20 20 F7
0FF9:20 A0 C4 B9 3C 00 F0 02 4A
1001:F8 00 B9 FD 54 33 10 85 C9
1009:F1 A0 09 B9 0C 08 99 FF BA
1011:03 88 8E 6B C0 40 2D 73 32
1019:2E DC 6C 87 AB F0 05 DB 94
1021:D8 0E B1 B9 6E 09 99 E8 B6
1029:07 C8 D0 E8 BB 01 EE 05 6C
1031:01 C6 F9 A1 3F 03 1B B3 CC
1039:33 C9 AC 65 16 A2 01 1B A9
1041:8C 04 47 6E 07 10 05 2F 2A
1049:6B 85 A8 A5 0F A9 A5 FE 59
1051:C6 4C FF 1A 94 A5 F8 85 3C
1059:FF A5 F7 85 FE 1D 3E B2 D5
1061:1E D3 B2 A0 02 E5 85 A6 3F
1069:18 61 A2 65 A6 85 C6 FD 6F
1071:65 A7 85 F8 20 6C 09 FC 30
1079:13 42 42 E2 1C A0 03 84 18
1081:A8 BD C8 F0 08 8A D9 48 F3
1089:A2 0A A8 10 E6 A7 4C 5C 5E
1091:01 DA 87 38 12 32 20 04 FA
1099:A8 D0 D6 E8 14 22 0A A2 8B
10A1:02 2F A1 18 69 06 D0 ED 37
10A9:A2 08 20 34 03 D0 E6 E5 73
10B1:2F A7 A4 FB F0 0C 06 FA 66
10B9:2A 26 A7 C6 FB CA D0 F2 79
10C1:A8 60 48 B1 FE 85 FA A9 20
10C9:08 85 FB 68 A4 FE D0 F5 0E
10D1:E0 57 FF C6 FE C0 E7 D0 40
10D9:DE A4 FF C0 07 D0 D8 A9 75
10E1:00 85 01 58 4C 00 10 A4 30
10E9:A8 F0 22 A5 F7 38 70 F0 AB
10F1:0A 03 8D 38 85 F7 87 71 99
10F9:84 A8 B0 02 8B 85 FC A0 C9
1101:05 88 91 FC 98 7C C4 A9 B3
1109:F0 0A B1 F7 C6 FD C6 F8 90
1111:C6 A9 10 EC 60 78 E6 01 85
1119:4C 16 08 E1 3E 60 13 D9 79
1121:9F 0B F0 11 C8 D0 F8 E6 67
1129:42 F0 07 C6 A6 D0 F0 4C 9C
1131:3D E8 02 41 0A 4C 1F 0B 4B
1139:6A 96 EA 11 11 E2 11 61 3C
1141:20 71 F5 FF 08 00 0D 9D 86
1149:34 7C 38 23 EE 02 08 EE 5C
1151:29 AD 05 08 C9 11 D0 EA B3
1159:00 BC 01 5C 3A E6 F8 20 10
1161:25 08 8A A8 0E 4A 4A 20 42
1169:30 08 98 29 0F C9 0A 69 68
1171:30 4C D2 FF 80 EE 73 07 C6
1179:46 17 0E 46 91 FA E9 01 F7
1181:61 19 FB E9 0E 85 AA 86 1B
1189:A9 C0 33 18 A2 0B A0 0A 25
1191:20 F0 FF D8 38 A5 FC 5A 3A
1199:CE AA A5 FD 68 8D A8 86 B3
11A1:A7 20 20 08 4C 80 0B 15 B3
11A9:37 81 86 90 08 D7 EB 23 3C
11B1:8E 09 B7 08 A0 8F 8C 84 B5
11B9:68 86 30 30 30 3D 06 8E CB
11C1:85 97 53 A8 20 A0 AB 6F CB
11C9:20 24 30 31 36 34 9B 91 69
11D1:86 00 8D 00 10 D8 CB 85 E9
11D9:2D 41 23 85 2E 54 C6 2E 1E
11E1:CE D0 08 B1 2D 99 2C 9C 80
11E9:C8 D0 F8 A5 2E C9 0F D0 A5
11F1:ED A5 AE EA EA EA 8D 33 4A
11F9:55 7A 40 0E A5 AF E9 08 16
1201:8D 37 0E 8D 41 0E 38 02 09
1209:73 09 E5 AE 85 AE A9 10 1B
1211:E5 AF 85 AF 4C 00 09 E6 1B
1219:26 44 E5 14 02 2A 20 D8 31
1221:20 02 D9 22 DA 9D 00 DB 5C
1229:80 0E BD 08 55 08 06 BD DD
1231:E8 17 9D E8 01 70 46 D0 F8
1239:F1 A9 00 20 00 1A 20 64 CF
1241:1A 4C 11 08 E6 76 BA 0B B9
1249:9D BA 05 AD 24 86 28 80 72
1251:6A 4E F0 1B C9 59 70 1F C1
1259:C0 8E 06 0D BD 80 16 9D CC
1261:3E 0D 8B F8 07 96 6C A9 FD
1269:99 91 41 D0 05 A9 8E 8D 6D
1271:DC 05 C1 71 63 E1 24 BD 3D
1279:B9 19 79 1B F7 4C E8 18 7C
1281:CD 87 E6 01 EE 20 D0 C6 BB
1289:01 00 BA 2C DE 23 E2 34 C5
1291:36 1E 0F 1D 3C 03 5E 10 C6
1299:C8 0D 0A 84 40 18 34 10 C9
12A1:A2 00 BD E9 02 9D 0C 06 12
12A9:E8 E0 17 D0 F5 4C 5B 03 05
12B1:F1 74 E8 B8 78 34 07 81 B8
12B9:96 89 8E 87 D7 7F E2 84 DC
12C1:85 8B 95 8C 8D DC 8E 95 99
12C9:8D 82 85 92 98 2B 33 37 3E
12D1:2B 8F 92 BA A0 A4 B0 B0 17
12D9:B0 B1 A0 96 81 8C 95 CB 75
12E1:39 0F 3C 4D 83 8F 8D 90 C8
12E9:79 32 93 88 01 98 43 E3 27
12F1:81 92 81 10 B1 AD B6 AC 0B
12F9:A0 8F 8E 85 A0 89 93 A0 6F
1301:86 81 9C 0B 85 93 94 D8 8B
1309:5D BC C7 4E 9E 47 47 8F 1B
1311:87 C3 87 C7 41 1D F7 A0 68
1319:20 E4 FF C9 31 90 F9 C9 AE
1321:37 B0 F5 F3 72 02 8D C8 8C
1329:05 49 80 D8 C6 30 AA A9 B7
1331:02 0A D0 15 FC AA 2A 5A 87
1339:0E 86 A6 E8 8E 3E 0E AD A2
1341:C8 05 D8 38 E9 A7 8D CE 83
1349:12 8D 61 10 CE 0E 70 C1 5A
1351:13 FB CE 10 08 D0 F6 A2 EE
1359:26 A9 20 9D B9 05 CA D0 23
1361:FA 4C 01 0A 60 EF 01 C3 61
1369:47 47 93 90 85 85 84 A0 6C
1371:BD A0 BF 5C DC 21 8B 85 64
1379:99 93 A0 B1 A0 94 8F A0 97
1381:B6 93 0B 14 01 A0 A0 F4 4B
1389:0F 22 1B 8D 11 3F 95 8C 39
1391:92 7F 8D 0D DC A9 1F 8D BC
1399:14 86 13 1A 8D 15 03 A9 DF
13A1:81 8D 1A D0 60 18 F7 19 A8
13A9:D0 AD E9 10 C9 9A D0 0C 48
13B1:90 A0 78 28 50 F0 0E C9 06
13B9:00 D0 0A A9 9A 8D 12 F2 12
13C1:38 06 4C 00 4C 31 EA 20 2C
13C9:15 86 0A A3 FD 20 A0 E5 2F
13D1:20 CC FF A9 0C 8D 21 28 D6
13D9:27 00 8D 20 D0 C0 03 8D 64
13E1:86 02 60 A2 00 A9 01 9D 48
13E9:00 D8 9D E0 D8 E8 D0 F7 0C
13F1:60 EB C6 8F 1F 62 C7 1E 45
13F9:31 65 1E 18 33 1E 0B 19 98
1401:1E 05 71 08 14 01 00 00 CC
1409:A9 EA 8D 28 03 4C 00 16 54
1411:C6 00 00 00 00 00 00 00 9C
```

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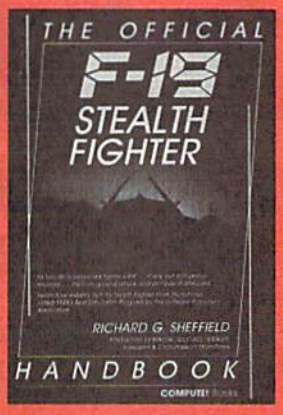

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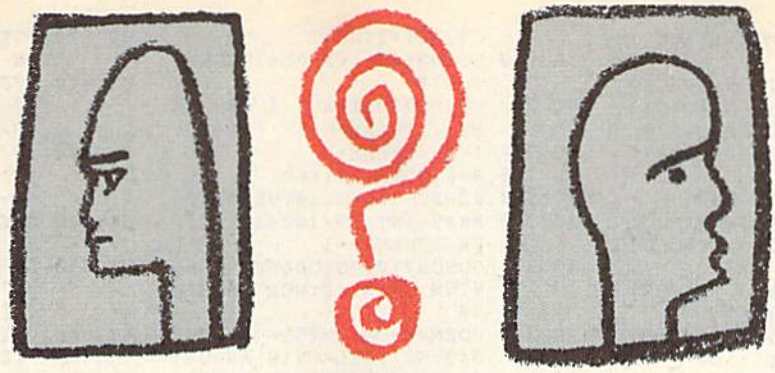


Sheerluck

Fred Karg

Are you a super sleuth? Find out in this graphically charming memory game for the Commodore 64. Joystick required.

Do you consider yourself a good armchair detective? Do you have a keen eye for detail, a good memory, and a nimble brain? You'll need all of these plus a bit of intuitive skill to master this game.

In *Sheerluck*, your job is to catch bank robbers by matching their mug shots with their names. But be careful. After getting out of the slammer, this slippery bunch of thieves quickly assume aliases. No problem, you say. After all, you have your new invention, the Truth Meter, to help you.

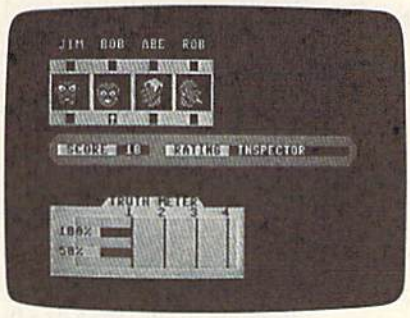
Getting Started

Sheerluck is written in BASIC. To avoid typing mistakes, enter it using *The Automatic Proofreader*, located elsewhere in this issue. When you've finished typing, be sure to save a copy of the program. To play the game, plug a joystick into port 2; then load and run the program.

At the start of the game, you'll see two names at the top of the screen. Under each name is a picture frame containing a mug shot. An up arrow (↑) appears beneath the frame on the left. To change the portrait that's in a particular frame, first move the joystick left or right to position the up arrow; then move it up or down to flip through the mug-shot collection (there are eight pictures). Note that in order to solve the crime, a different mug shot must appear in each frame.

When you think that you've matched the faces of the guilty with their names, press the fire button. The Truth Meter at the bottom of the screen measures the accuracy of your response. A red bar means that you are 100 percent correct—that is, you have the culprit under the right name. A green bar tells you that you are only 50 percent right—that is, you have the guilty person, but he's under the wrong name.

As an example, let's consider the simplest case of only two thieves. A red bar on the Truth Meter extending to 2 means that you've identified both criminals and can now proceed to the next level. A red bar measuring 1 means that only one of your choices is correct. A green bar reaching 2 means that you've nabbed both robbers, but that they're under the wrong names. A green bar measuring 1 means that you caught one of the guilty, but you have him under the wrong name. No response by the meter indicates that both choices are completely wrong.



The Truth Meter indicates that you've identified one thief and caught another.

Scoring

Your score decreases each time that you make a guess (whenever you press the fire button). If you do well, you're promoted to the next level. As you advance through the ranks, the number of criminals that you must identify increases, but you're allowed considerably more guesses. However, at the highest level you're expected to have the intuition of Sherlock Holmes and are given fewer guesses.

But don't worry. Even though you're always rated—Rookie, Private Eye, Chief Inspector, and so on—you're never demoted. After all, every gumshoe occasionally has a bad day.

Sheerluck

```
HQ 10 REM COPYRIGHT 1990 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
PG 20 POKE53280,6:POKE53281,6:
      PRINT"{CLR}":POKE781,7:P
      OKE782,14:POKE783,0:POKE
      53269,0
BQ 30 SYS65520:PRINT"{CYN}
      {RVS} SHEERLUCK ":Z=RND(
      -TI/100)
HB 40 PRINTSPC(3)"{11 DOWN}COP
      YRIGHT 1990 COMPUTE! PUB
      L., INC."
JB 50 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
BJ 60 A$="{YEL} JIM{2 SPACES}B
      OB{2 SPACES}ABE
      {2 SPACES}ROB{2 SPACES}B
      UD{2 SPACES}SAM
```

Sheerluck

```
      {2 SPACES}TOM{2 SPACES}D
      AN
CA 70 B$="{RVS}{WHT}{9 SPACES}
      1{3 SPACES}2{3 SPACES}3
      {3 SPACES}4{3 SPACES}5
      {3 SPACES}6{3 SPACES}7
      {3 SPACES}8
PH 80 C$="{RVS}{WHT} 100%
      {YEL}{3 SPACES}{M}
      {3 SPACES}{M}{3 SPACES}
      {M}{3 SPACES}{M}
      {3 SPACES}{M}{3 SPACES}
      {M}{3 SPACES}{M}
      {3 SPACES}{M}
PS 90 D$="{RVS}{WHT} 50%
      {2 SPACES}{YEL}
      {3 SPACES}{M}{3 SPACES}
      {M}{3 SPACES}{M}
      {3 SPACES}{M}{3 SPACES}
      {M}{3 SPACES}{M}
      {3 SPACES}{M}{3 SPACES}
      {M}
CM 100 E$="{RVS}{WHT} 100%
      {RED}{3 SPACES}{M}
      {3 SPACES}{M}{3 SPACES}
      {M}{3 SPACES}{M}
      {3 SPACES}{M}{3 SPACES}
      {M}{3 SPACES}{M}
      {3 SPACES}{M}
PC 110 F$="{RVS}{WHT} 50%
      {2 SPACES}{GRN}
      {3 SPACES}{M}{3 SPACES}
      {M}{3 SPACES}{M}
      {3 SPACES}{M}{3 SPACES}
      {M}{3 SPACES}{M}
      {3 SPACES}{M}{3 SPACES}
      {M}
FK 120 G$="{RVS}{WHT}
      {3 SPACES}{YEL}
      {6 SPACES}{M}{3 SPACES}
      {M}{3 SPACES}{M}
      {3 SPACES}{M}{3 SPACES}
      {M}{3 SPACES}{M}
      {3 SPACES}{M}{3 SPACES}
      {M}
BF 130 H$="{RVS}{WHT}
      {39 SPACES}":I$="{RVS}
      {WHT}
AS 140 J$="{1}{RVS}£
      {37 SPACES}{*}
CR 150 K$="{OFF}{1}{*}{RVS}
      {37 SPACES}{OFF}£":L$=
      "{WHT}{RVS}£TRUTH METE
      R{*}
BP 160 FORN=1TO9:READY$:R$(N)=
      Y$:NEXT
QF 170 DIMU%(92):FORN=1TO5:REA
      DFH(N):READFL(N):NEXT:N
      =0
FB 180 N=N+1:READU%(N):IFU%(N)
      <>0THEN180
MB 190 FORN=15872TO16383:READD
      :H=H+D:POKEN,D:NEXT
MD 200 IFH<>68445THENPRINT"DAT
      A STATEMENT ERROR.":STO
      P
EE 210 M=1:FA=7:U=54272:POKEU+
      5,48:POKEU+6,250:POKEU+
      3,7:POKEU+2,150
DK 220 POKEU+12,44:POKEU+13,24
      8:POKEV+9,99:POKEU+10,2
      55
PJ 230 S=12-((7-M)*2):SC=INT((
      1/(8-M)*99)):RR=9-INT(9
      9/(SC+10)):IFRR<1THENRR
      =1
RH 240 GOSUB380:FORN=0TOFA:C%(
      N)=N:NEXT:FORN=0TOM:R1=
      INT(RND(0)*(FA+1))
JB 250 R2=INT(RND(0)*(FA+1)):I
      FR1=R2THEN250
QJ 260 T=C%(R1):C%(R1)=C%(R2):
      C%(R2)=T:NEXT
CA 270 GOSUB540:IFR<>M+1THENGO
      TO270
DQ 280 GOSUB760:IFSC>(1/(8-M)*
      99)/3THENM=M+1
PQ 290 IFM>7THENM=7
KE 300 R=0:GOTO230:END
RS 310 SC=SC-1:IFSC<0THENSC=0
SD 320 RR=9-INT(99/(SC+10)):IF
      RR<1THENRR=1
AD 330 GOSUB710:GOSUB650:FORN=
      0TOM:D%(N)=0:NEXT:R=0:W
      =0
PS 340 FORN=0TOM:L=255-(PEEK(2
      040+N)):IFL=C%(N)ANDD%(
      N)=0THENR=R+1:D%(N)=1
BH 350 NEXT:FORN=0TOM:L=255-(P
      EEK(2040+N))
QJ 360 FORK=0TOM:IFL=C%(K)ANDD
      %(K)=0THENW=W+1:D%(K)=1
      :K=M
GQ 370 NEXT:NEXT:GOSUB690:RETU
      RN
SF 380 PRINT"{CLR}":A=1346:PRI
      NTLEFT$(A$,(M+1)*5)
GF 390 V=53248:POKEV+28,255:PO
      KEV+37,1:POKEV+38,10:PO
      KEV+27,255:POKEV+29,0
SF 400 POKEV+23,0:FORN=0TOM:X=
      29+N*40:IFX>255THENX=X-
      255
MR 410 POKEV+N*2,X:POKEV+1+2*N
      ,88:POKEV+39+N,0:POKE20
      40+N,255:NEXT
HD 420 T=0:FORN=0TOM:T=T+2↑N:N
      EXT
AM 430 POKEV+16,192:FORN=0TOM:
      PRINT"{WHT}{5 @}";:NEXT
      :IFM<>7THENPRINT
EE 440 FORN=0TOM:PRINT"{RVS}
      {WHT}{2 SPACES}{OFF}
      {RVS}{2 SPACES}";:NEXT:
      IFM<>7THENPRINT
EC 450 FORN=0TOM:PRINT"{OFF}
      {WHT}O{3 Y}P";:NEXT:IFM
      <>7THENPRINT
MH 460 FORN=0TOM:PRINT"{OFF}
      {WHT}{H}{3 SPACES}{N}";
      :NEXT:IFM<>7THENPRINT
GE 470 FORN=0TOM:PRINT"{OFF}
      {WHT}{H}{3 SPACES}{N}";
      :NEXT:IFM<>7THENPRINT
HP 480 FORN=0TOM:PRINT"{WHT}L
      {3 P}@";:NEXT:IFM<>7THE
      NPRINT
AA 490 FORN=0TOM:PRINT"{RVS}
      {WHT}{2 SPACES}{OFF}
      {RVS}{2 SPACES}";:NEXT:
      IFM<>7THENPRINT
CR 500 FORN=0TOM:PRINT"{WHT}
      {OFF}{5 T}";:NEXT:POKEV
      +21,T:POKEA,30
SG 510 SP=0:PI=0:IFM<>7THENPRI
      NT
AA 520 PRINTJ$:GOSUB710:PRINTK
      $:PRINT:PRINT"{2 DOWN}"
      SPC(M*2)L$
XX 530 PRINTLEFT$(H$,(M+2)*4+6
      ):GOSUB650:PRINTLEFT$(H
      $,(M+2)*4+6):RETURN
XX 540 J=PEEK(56320):F=JAND16:
      J=15-(JAND15):PA=A:IFF=
      0GOTO310
XA 550 IFJ=0THENRETURN
JE 560 IFJ=1ORJ=2THENGOSUB590:
      GOTO580
BE 570 GOSUB620
BR 580 FORN=0TO100:NEXT:RETURN
SM 590 IFJ=1THENPI=PI+1:IFPI>F
      ATHENPI=0
AR 600 IFJ=2THENPI=PI-1:IFPI<0
      THENPI=FA
HC 610 POKE2040+SP,255-PI:RETU
      RN
QM 620 IFJ=8THENA=A+5:SP=SP+1:
      IFA>1346+M*5THENA=1346:
      SP=0
SA 630 IFJ=4THENA=A-5:SP=SP-1:
      IFA<1346THENA=1346+M*5:
      SP=M
GK 640 POKEPA,32:POKEA,30:RETU
      RN
FH 650 POKE781,17:POKE782,0:PO
      KE783,0:SYS65520:PRINTL
      EFT$(B$,(M+1)*4+9)I$
AM 660 PRINTLEFT$(G$,(M+2)*4+6
      )I$
PQ 670 PRINTLEFT$(C$,(M+2)*4+6
      )I$:PRINTLEFT$(G$,(M+2)
      *4+6)I$
RQ 680 PRINTLEFT$(D$,(M+2)*4+6
      )I$:PRINTLEFT$(G$,(M+2)
      *4+6)I$:RETURN
QF 690 POKE781,19:POKE782,0:PO
      KE783,0:SYS65520
QH 700 PRINTLEFT$(E$,(R)*4+9):
      PRINT:PRINTLEFT$(F$,(W)
      *4+9):N=FRE(0):RETURN
PX 710 POKE781,11:POKE782,0:PO
      KE783,0:SYS65520
KG 720 PRINT"{RVS}{1} {WHT} SC
      ORE {OFF}{3 SPACES}
      {3 LEFT}"SC"{RVS}{1}
      {2 SPACES}{WHT} RATING
      {SPACE}{OFF} "R$(RR)"
      {RVS}{1} ":RETURN
KP 730 DATA"UNEMPLOYED
      {6 SPACES}"
CX 740 DATA"ROOKIE{9 SPACES}",
      "SHEERLUCK{6 SPACES}","
      PRIVATE EYE{4 SPACES}",
      "DETECTIVE{6 SPACES}
DS 750 DATA"INSPECTOR
      {6 SPACES}","MASTERMIND
      {5 SPACES}","CHIEF INSP
      ECTOR","SHERLOCK HOLMES
EQ 760 POKEU+24,15:FORN=1TO81S
      TEP2:POKEU+1,FH(U%(N)):
      POKEU,FL(U%(N))
GK 770 POKEU+8,FH(U%(N)):POKEU
      +7,FL(U%(N)):POKEU+4,65
      :POKEU+11,65
XR 775 FORT=1TO(U%(N+1)):NEXT
XM 780 POKEU+4,64:POKEU+11,64:
      NEXT:POKEU+24,0:RETURN
XC 790 DATA16,195,18,195,21,31
      ,22,96,25,30
QK 800 DATA1,125,3,125,4,125,5
      ,512,5,125,1,125,3,125,
      4,125,5,512,5,125
GR 810 DATA1,125,3,125,4,125,5
      ,256,3,256,1,256,3,256,
      2,512
CF 820 DATA2,125,3,125,3,125,2
      ,125,1,512,3,256,5,256,
      5,125,4,256
BM 830 DATA3,256,5,256,5,125,4
      ,768,4,256,3,125,4,125,
      5,256,3,256
ER 840 DATA1,256,2,256,2,256,1
      ,512,1,125,0,2,170,128,
      2,170,128,2,170
XP 850 DATA128,170,170,170,170
      ,170,170,42,255,168,47,
      190,248,61,255,124
HS 860 DATA245,125,95,198,125,
      147,229,255,91,63,255,2
      52,63,243,240,15
SM 870 DATA243,240,15,255,240,
      3,232,192,3,60,192,3,25
      5,192,3,255
GH 880 DATA192,2,255,128,0,190
      ,0,0,5,85,80,21,85,84,3
      1,255
```

```
AS 890 DATA244,53,255,92,31,12
       5,246,62,255,190,250,19
       0,175,249,190,111
EA 900 DATA218,255,167,63,255,
       254,15,255,254,15,255,2
       48,15,195,248,3
RH 910 DATA215,224,3,125,224,3
       ,235,224,3,255,224,0,25
       5,128,0,62
DB 920 DATA0,0,8,0,0,0,0,2,0,1
       ,64,0,21,80,0,85
SA 930 DATA84,1,245,85,3,245,8
       5,1,253,93,2,191,83,2,1
       11,115
HA 940 DATA15,255,79,63,255,20
       4,60,255,252,3,255,204,
       15,255,240,15
QG 950 DATA63,12,0,63,60,3,252
       ,60,15,252,252,15,240,2
       52,0,3
AC 960 DATA252,0,63,240,0,63,0
       ,252,0,0,0,3,252,0,15,2
       55
QH 970 DATA0,15,255,0,63,255,1
       92,63,255,192,251,254,1
       28,239,250,0
SG 980 DATA59,255,240,59,255,2
       52,63,255,60,55,255,192
       ,15,255,240,58
XP 990 DATA252,240,62,252,48,6
       0,191,208,63,63,244,63,
       47,241,63,202
FM 1000 DATA128,15,252,0,0,252
        ,0,252,8,0,0,34,128,0,
        42,32
CQ 1010 DATA0,170,160,0,160,40
        ,0,138,252,0,175,175,1
        92,190,95,240
BM 1020 DATA185,31,252,191,127
        ,252,175,252,0,171,255
        ,176,42,254,208,35
BC 1030 DATA251,80,47,241,64,1
        1,205,60,3,255,255,0,2
        55,243,3,243
SP 1040 DATA252,15,252,0,63,24
        0,0,252,0,42,0,0,42,0,
        0,234
CS 1050 DATA192,3,234,240,15,2
        34,252,43,234,248,42,2
        55,234,134,191,166
FK 1060 DATA149,174,149,150,10
        6,101,165,106,86,42,19
        1,170,42,204,234,63
PG 1070 DATA255,252,15,215,252
        ,13,0,124,12,60,48,15,
        125,240,3,215
RH 1080 DATA240,3,255,192,0,25
        5,0,0,0,0,0,0,170,0,2,
        170
CJ 1090 DATA128,10,235,160,47,
        255,224,191,255,248,18
        7,255,184,234,254,172
XB 1100 DATA238,186,236,253,18
        5,252,245,69,124,244,1
        16,124,253,253,252,60
RK 1110 DATA255,240,63,187,240
        ,62,254,240,63,87,240,
        15,223,192,15,255
KM 1120 DATA192,3,255,0,0,252,
        0,0,10,170,160,42,170,
        168,47,255
KM 1130 DATA248,58,255,172,47,
        190,248,53,255,92,245,
        125,95,246,125,159
PQ 1140 DATA229,255,91,59,190,
        236,190,255,186,47,255
        ,248,47,60,248,47
FQ 1150 DATA235,248,46,190,184
        ,46,215,184,43,255,232
        ,47,235,248,11,235
CF 1160 DATA224,10,170,160,2,1
        70,128,2
```

G

bug-swatter

• *DirQuick* (February 1990) doesn't work correctly with GEOS 128 or GEOS 128 2.0. The program performs flawlessly until you try to return to your application or to the deskTop. We've contacted the author about the problem, but at this time, we haven't discovered a solution. Keep an eye on this column for a correction in the coming months.

• Many of you who have *RapiDOS PRO* installed on your systems have been unable to run BASIC programs entered using *The Automatic Proofreader*. When *RapiDOS* is installed, *The Automatic Proofreader* moves the start-of-BASIC text up to $0901 (2305). Since *RapiDOS* always loads files to the location from where they were saved (it always loads files as if you had typed LOAD"*filename*",8,1), programs entered using *Proofreader* load into the wrong memory location.

If you have access to a 64 without *RapiDOS*, you can correct the programs by loading them on that machine and then resaving them. If you don't have access to another machine, use the following program.

```
10 N=8:D$="1541":T$=CHR$(18):S
     $=CHR$(1):IFD$="1581"THE
     NT$=CHR$(40):S$=CHR$(3)
20 INPUT"FILE TO CONVERT";NM$:
     OPEN15,N,15,"I0:":OPEN1,
     N,8,"0:"+NM$+",P,R"
30 GOSUB240:IFEN<>0THENPRINT"
     {RVS}"EN$" "EM$ET$EE$:GO
     TO200
40 GET#1,K$,V$:PRINT"SA ="ASC(
     K$+CHR$(0))+ASC(V$+CHR$(
     0))*256
50 IFK$=CHR$(1)ANDV$=CHR$(8)TH
     ENPRINT"FILE STARTS AT $
     0801":GOTO200
60 PRINT"FILE DOESN'T START AT
      $0801":PRINT"DO YOU WAN
     T TO MOVE IT? ";
70 GETK$:IFK$<>"Y"ANDK$<>"N"TH
     EN70
80 PRINTK$:IFK$="N"THEN200
90 NL$="":OPEN2,N,2,"#"
100 GOSUB210:GET #2,NT$,NS$:FO
     RE=0TO7:D$=NL$:GET#2,B$:
     I=1:IFB$=NL$THEN150
110 GET#2,HT$,HS$:I=3:IFHS$=""
     THENHS$=CHR$(0)
120 GET#2,B$:I=I+1:IFB$=""THEN
     B$=CHR$(0)
130 IF(ASC(B$)=160)OR(I=19)THE
     N150
140 D$=D$+B$:GOTO120
150 FORI=1TO31:GET#2,B$:NEXTI:
     IFD$=NM$THEN180
160 NEXTE:IFNT$=NL$THEN180
170 T$=NT$:S$=NS$:GOTO100
180 IFD$=NL$THENPRINT"{DOWN}DI
     SK ERROR!":GOTO200
190 T$=HT$:S$=HS$:GOSUB210:GET
    #2,B$,B$:PRINT#2,CHR$(1)CHR
    $(8);:GOSUB220
200 CLOSE1:CLOSE2:CLOSE15:END
210 U$="U1":GOTO230
220 U$="U2"
230 PRINT#15,U$;2;0;ASC(T$+"0"
     );ASC(S$+"0"):RETURN
240 INPUT#15,EN,EM$,ET,EE:EN$=
     STR$(EN):ET$=STR$(ET):EE
     $=STR$(EE):RETURN
```

Be very careful when entering these lines of code because you can't use *The Automatic Proofreader* to check your typing. Until you're sure that you've entered the program correctly, copy the files that you want to correct to a scratch disk and then work on the copies.

To use the program, load it, put the disk containing the programs to be corrected into the drive, and then type RUN. When you're prompted for a filename, enter the name of a file that you want to relocate to $0801 (the normal start of BASIC). The program will scan the disk's directory, find the file, and then change the file's load address.

When using this program, be especially careful; it can change the starting address of machine language programs as easily as it can BASIC programs. To be safe, always work on copies of files, not on the originals.

• The listing of BFX.ML that accompanies the *Bitmap Effects* article in the January 1990 issue has a missing character in line C5F4. The line should read as follows:

```
C5F4: D0 F6 A9 6D 8D F8 5F 60 22
```

G

COMPUTE!'s Gazette is looking for utilities, games, applications, educational programs, and tutorial articles. If you've created a program that you think other readers might enjoy or find useful, send it, on disk, to: **Submissions Reviewer, COMPUTE! Publications, P.O. Box 5406, Greensboro, NC 27403.** Please enclose an SASE if you wish to have the materials returned. Articles are reviewed within four weeks of submission.

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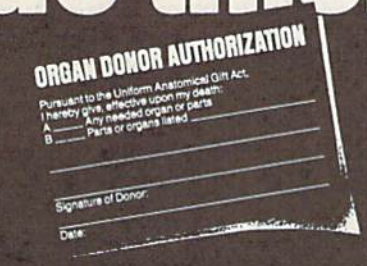
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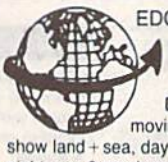

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MLX Machine Language Entry Program for Commodore 64

Ottis R. Cowper

MLX is a labor-saving utility that allows almost fail-safe entry of Commodore 64 machine language programs.

Type in and save some copies of *MLX*—you'll want to use it to enter future ML programs from *COMPUTE!'s Gazette*. When you're ready to enter an ML program, load and run *MLX*. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the *MLX*-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in *MLX*) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters *A–F*. But even if you know nothing about ML or hex, you should have no trouble using *MLX*.

After you've entered the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is Enter Data. If you're just starting to type in a program, pick this. Press the E key and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you stopped typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering a Listing

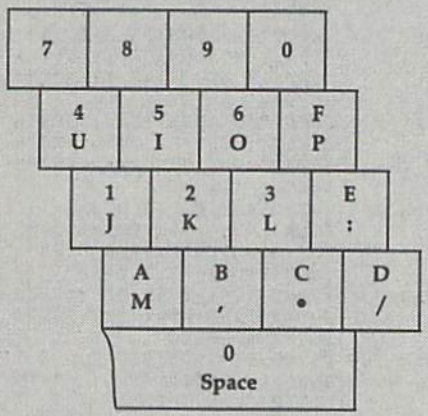
Once you're in Enter mode, *MLX* prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an *MLX*-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows *MLX* to check your typing.

When you enter a line, *MLX* recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if *MLX* detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; *MLX* automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; *MLX* automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters *A–F* can be entered. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, a numeric keypad function is included. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration.



MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, *MLX* will catch your mistake. There is one error that can slip past *MLX*: Because of the checksum formula used, *MLX* won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. If you mess up a line badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character, *MLX* disables RETURN until the cursor returns to the start of a line. Remember, press CLR/HOME to quickly get to a line-number prompt.

To make corrections in a line that *MLX* has redisplayed for editing, compare the line on the screen with the one printed in the listing and then move the cursor to the mistake and type the correct key. The cursor-left and -right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells *MLX* to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch or if you want to get to a line-number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, Display Data, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, *MLX* asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. *MLX* displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (*MLX* finishes printing the current line before halting.) Press the space bar again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are Save File and Load File. When you press S or L, *MLX* asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. This is normal behavior. *MLX* opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Also note that the drive prefix 0: is added to the filename (line 750), so this should *not* be included when entering the name. This also precludes the use of @ for save-with-replace, so be sure to give each version saved a different name.

Remember that *MLX* saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When you're saving a partially completed listing, make sure to note the address where you stopped typing.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. It also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran *MLX;* LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started *MLX;* and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started *MLX*. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun *MLX*, being careful to enter the correct starting and ending addresses.

The Quit menu option has the obvious effect—it stops *MLX* and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or press any other key to return to the menu. After quitting, you can type RUN again and reenter *MLX* without losing your data, as long as you don't use the Clear Workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready for the results. Refer to the corresponding article for details on loading and running the program.

An Ounce of Prevention

By the time you've finished typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use *The Automatic Proofreader* to type the new *MLX*, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses; then use the display option to verify that the data has been entered correctly. And be sure to test the save and load options several times to ensure that you can recall your work from disk or tape.

64 MLX

```
EK 100 POKE 56,50:CLR:DIM IN$,I,
       J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z4=
       254:Z5=255:Z6=256:Z7=127
CJ 120 FA=PEEK(45)+Z6*PEEK(46):B
       S=PEEK(55)+Z6*PEEK(56):H$
       ="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}":S
       $=" ":D$=CHR$(20):Z$=CHR$
       (0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD+2
       3:POKE I,0:NEXT:POKE SD+2
       4,15:POKE 788,52
FC 150 PRINT"{CLR}"CHR$(142)CHR$
       (8):POKE 53280,15:POKE 53
       281,15
EJ 160 PRINT T$" {RED}{RVS}
       {2 SPACES}{8 @}{2 SPACES}
       "SPC(28)"{2 SPACES}{OFF}
       {BLU} MLX II {RED}{RVS}
       {2 SPACES}"SPC(28)"
       {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}{3 SPACES}C
       OMPUTE!'S MACHINE LANGUAG
       E EDITOR{3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADDRE
       SS{4}";:GOSUB300:SA=AD:GO
       SUB1040:IF F THEN180
GF 190 PRINT"{BLK}{2 SPACES}ENDI
       NG ADDRESS{4}";:GOSUB300:
       EA=AD:GOSUB1030:IF F THEN
       190
KR 200 INPUT"{3 DOWN}{BLK}CLEAR
       {SPACE}WORKSPACE [Y/N]{4}
       ";A$:IF LEFT$(A$,1)<>"Y"T
       HEN220
PG 210 PRINT"{2 DOWN}{BLU}WORKIN
       G...";:FORI=BS TO BS+EA-S
       A+7:POKE I,0:NEXT:PRINT"D
       ONE"
DR 220 PRINTTAB(10)"{2 DOWN}
       {BLK}{RVS} MLX COMMAND ME
       NU {DOWN}{4}":PRINT T$"
       {RVS}E{OFF}NTER DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISPLA
       Y DATA":PRINT T$"{RVS}L
       {OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE F
       ILE":PRINT T$"{RVS}Q{OFF}
       UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=MI
       D$("EDLSQ",I,1)THEN A=I:I
       =5
FD 270 NEXT:ON A GOTO420,610,690
       ,700,280:GOSUB1060:GOTO25
       0
EJ 280 PRINT"{RVS} QUIT ":INPUT"
       {DOWN}{4}ARE YOU SURE [Y/
       N]";A$:IF LEFT$(A$,1)<>"Y
       "THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IFLE
       N(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$=M
       ID$(IN$,3):GOSUB320:AD=AD
       *256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID$(
       B$,J,1):B=ASC(A$)-C4+(A$>
       "@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=0:
       A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(H$
       ,B+1,1);:B=A-B*C6:PRINT M
       ID$(H$,B+1,1);:RETURN
RR 360 A=INT(AD/Z6):GOSUB350:A=A
       D-A*Z6:GOSUB350:PRINT":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*CK
       +Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       {4}";:GOSUB300:IF IN$<>N$
        THEN GOSUB1030:IF F THEN
       400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA ":
       GOSUB400:IF IN$=N$ THEN22
       0
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F T
       HEN PRINT IN$:PRINT"{UP}
       {5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$=S
       $:FOR J=1 TO 2:IF F THEN
       {SPACE}B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<24
       THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A$>
       "@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-3*
       (A$=".")-4*(A$="/")-5*(A$
       ="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":")
       -9*(A$="U")-10*(A$="I")-1
       1*(A$="O")-12*(A$="P")
CM 487 A=A-13*(A$=S$):IF A THEN
       {SPACE}A$=MID$("ABCD123E4
       56F0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J=1
       )OR F)THEN PRINT B$;:J=2:
       NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRINT
        B$:J=2:NEXT:I=24:NEXT:F=
       0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF THEN
       PRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR((
       I=0)AND(J=1))THEN GOSUB10
       60:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;:J
       =2-J:IF J THEN PRINT L$;:
       I=I-3
QS 540 PRINT A$;:NEXT J:PRINT S$
       ;
PM 550 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:INPUT#3,IN$:I
       F IN$=N$ THEN CLOSE3:GOTO
       220
QC 560 FOR I=1 TO 25 STEP3:B$=MI
       D$(IN$,I):GOSUB320:IF I<2
       5 THEN GOSUB380:A(I/3)=A
PK 570 NEXT:IF A<>CK THEN GOSUB1
       060:PRINT"{BLK}{RVS} ERRO
       R: REENTER LINE {4}":F=1:
       GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FOR
       {SPACE}I=0 TO 7:POKE B+I,
       A(I):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN CLO
       SE3:PRINT"{DOWN}{BLU}** E
       ND OF ENTRY **{BLK}
       {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
```

```
QA 610 PRINT"{CLR}{DOWN}{RVS} DI
       SPLAY DATA ":GOSUB400:IF
       {SPACE}IN$=N$ THEN220
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAUSE,
        {RVS}RETURN{OFF} TO BREA
       K{4}{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FORI=
       BTO B+7:A=PEEK(I):GOSUB35
       0:GOSUB380:PRINT S$;
CC 640 NEXT:PRINT"{RVS}";:A=CK:G
       OSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA THEN
       PRINT"{DOWN}{BLU}** END O
       F DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GOSU
       B1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOSUB
       1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD DA
       TA ":OP=1:GOTO710
PC 700 PRINT"{DOWN}{RVS} SAVE FI
       LE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILENA
       ME{4}";IN$:IF IN$=N$ THEN
       220
PR 720 F=0:PRINT"{DOWN}{BLK}
       {RVS}T{OFF}APE OR {RVS}D
       {OFF}ISK: {4}";
FP 730 GET A$:IF A$="T"THEN PRIN
       T"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8,1
       5,"I0:":B=EA-SA:IN$="0:"+
       IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":GOS
       UB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(AH*
       256):PRINT#1,CHR$(AL);CHR
       $(AH);
PE 780 FOR I=0 TO B:PRINT#1,CHR$
       (PEEK(BS+I));:IF ST THEN8
       00
FC 790 NEXT:CLOSE1:CLOSE15:GOTO9
       40
GS 800 GOSUB1060:PRINT"{DOWN}
       {BLK}ERROR DURING SAVE:
       {4}":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":GOS
       UB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z$)
       +256*ASC(B$+Z$):IF AD<>SA
        THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:POK
       E BS+I,ASC(A$+Z$):IF(I<>B
       )AND ST THEN F=2:AD=I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F>0
       )+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN C
       LOSE1:CLOSE15:GOSUB1060:P
       RINT"{RVS}ERROR: "A$
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE18
       7,PEEK(FA+3):POKE188,PEEK
       (FA+4):IFOP=0THEN920
HJ 890 SYS 63466:IF(PEEK(783)AND
       1)THEN GOSUB1060:PRINT"
       {DOWN}{RVS} FILE NOT FOUN
       D ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(830
       ):IF AD<>SA THEN F=1:GOTO
       970
SC 910 A=PEEK(831)+256*PEEK(832)
       -1:F=F-2*(A<EA)-3*(A>EA):
       AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:POK
       E780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOSUB
       1010:ON OP GOTO950:SYS 63
       591
AE 940 GOSUB1080:PRINT"{BLU}** S
       AVE COMPLETED **":GOTO220
XP 950 POKE147,0:SYS 63562:IF ST
       >0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}** L
       OAD COMPLETED **":GOTO220
DP 970 GOSUB1060:PRINT"{BLK}
       {RVS}ERROR DURING LOAD:
       {DOWN}{4}":ON F GOSUB980,
       990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTING
       {SPACE}ADDRESS (";:GOSUB3
       60:PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:AD
       =SA+AD:GOSUB360:PRINT D$:
       RETURN
FD 1000 PRINT"TRUNCATED AT ENDIN
       G ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH*2
       56):POKE193,AL:POKE194,A
       H
FF 1020 AH=INT(B/256):AL=B-(AH*2
       56):POKE174,AL:POKE175,A
       H:RETURN
FX 1030 IF AD<SA OR AD>EA THEN10
       50
HA 1040 IF(AD>511 AND AD<40960)O
       R(AD>49151 AND AD<53248)
       THEN GOSUB1080:F=0:RETUR
       N
HC 1050 GOSUB1060:PRINT"{RVS} IN
       VALID ADDRESS {DOWN}
       {BLK}":F=1:RETURN
AR 1060 POKE SD+5,31:POKE SD+6,2
       08:POKE SD,240:POKE SD+1
       ,4:POKE SD+4,33
DX 1070 FOR S=1 TO 100:NEXT:GOTO
       1090
PF 1080 POKE SD+5,8:POKE SD+6,24
       0:POKE SD,0:POKE SD+1,90
       :POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:POKE
        SD+4,0:POKE SD,0:POKE S
       D+1,0:RETURN                G
```


cp/m c-128 cp/m c-128 cp/m c-128 cp/m c-128 cp/m c-128 cp/m c-128

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Circle Reader Service Number 113

How to Type In COMPUTE!'s Gazette Programs

Each month, *COMPUTE!'s Gazette* publishes programs for the Commodore 128 and 64. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We regularly publish two programs designed to make typing easier: *The Automatic Proofreader*, for BASIC programs, and *MLX*, for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off and then on, erasing what was in memory. This could cause you to lose valuable data, so be sure to *save a program before you run it*. If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from *Gazette*, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor-down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be shifted (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight shifted A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT} and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is the *quote mode*.

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a graphics symbol for cursor left. In this case, you can use the DEL key to back up and edit the line. Type another quotation mark and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

REVIEWS

Knights of Legend

With so many fantasy role-playing (FRP) games released throughout the year, it's hard not to become a bit jaded. But reviewing *Knights of Legend* was a pleasure. This game is the result of many years' work, and it shows.

Although not a complicated game, *Knights of Legend* relies on a new system, but it's one you can quickly learn. In a matter of a half-hour or so, you'll be feeling right at home in the game.

Knights of Legend's designer, Todd Porter, created the game with a vision of quick play and detailed characters, combat, and geography.

In hoping to rise above other FRP games that were slow and nothing more than war games in fantasy lands, Porter devised a system that makes *Knights* very easy to play. It consists largely of selecting icons that represent the options available at any point to move around within the geography of the game. You use the keyboard to play. It takes only a few defined keys to move the party on the screen, to select icons, and to scroll through lists. I couldn't imagine using a joystick with *Knights* after playing with the keyboard.

In *Knights*, you may have as many as six adventurers in your party. I would suggest using this number to get full enjoyment from and success in the game. The game screen consists of a plate at the bottom that contains the available icons, pictures of the characters in your party along the top, and a large window for the graphics.

Everything from the geography to pictures of monsters appears in the graphics window. The pictures are well drawn and greatly detailed. Plus, there are a lot of them. The disks are packed with graphics that really bring the game to life.

The plot is simple. You must travel through the land of Ashtalarea, looking for quests and trying to increase the rank of your characters from serf to knight. There are many grades of character levels, so don't expect them to become knights in a matter of days.

Knights is chock-full of quests for your party, and the geography is extensive. Included with the game is a full-color map of Ashtalarea that I found to be a necessity in locating places when sent on a quest.

As for your characters, choose from among four species: Human, Dwarven, Elven, and Kelden. The Kelden are a winged species created by Porter for *Knights*. You can create both male and female characters for the Humans and Elves, but only male Dwarves and Kelden are possible. There are many human races available and a few for each of the other species. Character development is very important, more so than in other FRP games because the characters are integrated so deeply in the plot. Factors like fatigue and encumbrance figure heavily in *Knights*.

> *A refreshing change in the fantasy role-playing genre,* **Knights of Legend** *is the result of many years' work—and it shows.*

Much effort in *Knights* went into developing a combat system that is quick, yet not boring to use. In some games I've played, you do nothing but sit back and watch the screen as a battle progresses; in others you press one or two keys until the monsters are defeated. In *Knights*, you use the icons to fight the battles. In combat, you decide how quickly each character approaches an enemy, whether to use a ranged or a close-combat weapon, whether to use magic or not, and how to defend. You decide where to attack (high, medium, or low) and, if unarmed, how to strike the enemy, including the choice of a wonderful head-butt option.

After fighting a couple of battles, you'll get used to this system. It works smoothly, and all the hype is warranted. Also, *Knights* is not like some games that take up all of your time with fighting; it's well balanced.

Overall, *Knights of Legend* is a refreshing change in the FRP game genre. In case you're not familiar with icons, a reference card displays them all. The manual is well written and includes the story of the land of Ashtalarea and tales of the races and classes. With these stories and his efforts, Porter has created a world not unlike that of Tolkien, full of detail and colorful characters.

—Russ Ceccola

Knights of Legend
Origin
P.O. Box 161750
Austin, TX 78716
$49.95

Blue Angels

Years ago I called for recognition of computer flight simulators as a new category of software. I felt it was important that the growing number of those programs should be judged against one another rather than against *Zork*, *Space Invaders*, and *Gorf*. Since that time, the number of flight simulators has increased beyond belief, yet I think I may have been premature in my request.

The cause for alarm is *Blue Angels* from Accolade: Though billed as a flight simulator, it's more an arcade game designed to tax hand/eye coordination.

For anyone who's seen the real thing, flying with the Navy's Blue Angels would seem to be the ultimate test of flying ability. Such aerial maneuvers are just short of incredible when performed by a single aircraft; when performed in formation with only inches between wing tips, they're astounding.

I found none of this excitement in the computer game, however. While it is difficult to define the qualities that make such games as *Pac-Man* a mega-hit, it is just as difficult to say what is missing in *Blue Angels*.

That Accolade tried hard is evident in the structure of the program. Spectator View takes you through a demonstration of all the maneuvers; Simulator allows you to practice individual ma-

neuvers and to see your performance evaluated on a graph; and Practice Maneuvers commits you to the real thing.

After that, you can choose Simulate an Airshow, Practice an Airshow, or Perform an Airshow, each of which consists of a series of maneuvers. All modes look alike from the cockpit, but you do have the option of adding or deleting items from your control console.

A system of menus speeds you through the flying choices. Select your position within a formation, decide on a maneuver, and choose help options.

The help options occupy most of your control console, keeping it from bearing any resemblance to the controls of an F/A-18. From left to right on your console you'll see a box with arrows that indicates the next direction the formation will fly, a series of boxes that forms a moving tunnel through which you must maneuver, and another screen that indicates the name of the next maneuver.

To be readable, these aids are large, limiting the windscreen view to the upper one-third of the monitor. Here you'll see green earth, blue sky, and—if you're the number 4 man in the diamond formation—the tailpipe and wings of your leader.

Don't buy its billing as a flight simulator; as an arcade challenge, however, it will tax your reflexes as well as any game I've seen.

Because the windscreen view is so limited, it's difficult to know where you are at all times. If the flight leader moves from your narrow range of vision, you can become lost in a very short time. Unless you keep both land and sky within your visual range, you'll have no way of knowing your present flight attitude.

With all of this, it may seem *Blue Angels* deserves little consideration, but that's not exactly true. If you're expecting a conventional flight simulator, *Blue Angels* will disappoint you. As an arcade challenge however, it will tax your reflexes as well as any other game I've seen. In fact, I found it an unqualified relief to explore a new game that has nothing to do with martial arts. Considered in that light, it may be very welcome to those who remember some of yesteryear's computer puzzles and wish for their return.

Excellent sound and graphics, what we have come to expect from Accolade, are found in *Blue Angels*. Playability as an arcade game is also good. The documentation explains clearly what you are up against. The complexity of the maneuvering diagrams in the back of the book may drive you to despair at first, but the name of the game is practice, and *Blue Angels* gives you the help of some of the best wingmen in the business.

—Ervin Bobo

Blue Angels
Accolade
550 S. Winchester Blvd.
San Jose, CA 95128
$49.95

Beyond Dark Castle

In this sequel to *Dark Castle*, Prince Duncan returns to face his sworn enemy, the Black Knight, in mortal combat. Before the main event, however, he'll have to search the castle for five powerful magic orbs. Only by returning the orbs to their proper pedestals in the castle's anteroom will Duncan earn the right to battle the Black Knight.

Of course, your search through the castle won't exactly be a pleasant scavenger hunt. Along the way you'll battle a variety of deadly bats, armed castle guards, whip-toting henchmen, poisonous snakes, vultures, and flaming eyeballs. You'll also have to overcome a number of carefully laid traps and logic puzzles. To survive in this castle, you must possess not only a quick and accurate joystick, but also sharp puzzle-solving skills.

Beyond Dark Castle can be played at any of three skill levels: Beginner, Intermediate, or Advanced. As you play, you control Duncan with your favorite joystick in conjunction with specific keyboard commands. The f7 key, for instance, is the action key used to pick up and employ a variety of objects.

You start the game with five lives and 60 rocks to throw at your enemies. As you explore the castle, however, you may find lethal fireballs to replace your rocks. Other useful items waiting to be found include bombs, elixirs, food, keys, a chopper-pack that allows Duncan to fly over dangerous swamps and forests, gas to power the chopper-pack, and a shield for temporary protection.

Throughout the game, the number of each type of item collected, along with the name of the current room, and a red bar graph representing your health/stamina are displayed at the bottom of the screen.

Beyond Dark Castle is one of the toughest arcade games I've played in a long time. However, there are a couple of things you can use to help tip the scales in your favor. First, there is a map screen that shows the overall layout of the castle as well as the locations of the five orbs and other useful items. Second, there is a practice mode that lets you tackle any of the castle's 12 rooms with an unlimited supply of lives, rocks, bombs, elixirs, and keys. As you might expect, the only part of the game that can't be practiced is your final showdown with the Black Knight.

Beyond Dark Castle features nicely rendered graphics and detailed animation. Duncan's movements and those of the various enemies he faces, for example, are fluid and realistic. Each of the castle's rooms is a unique puzzle that must be solved before you move on.

Unfortunately, even though *Beyond Dark Castle* is a good game, it could have been a lot more enjoyable if it didn't require as much disk access. Not only does the initial load take several minutes, but the disk also spins when you simply move from room to room. Most frustrating of all, once you lose all five lives, you have to listen to the disk whir for close to four minutes before you can try again. The player's manual recommends using a fast-loader cartridge to speed up disk access when playing *Beyond Dark Castle*. This is advice you won't want to ignore unless, of course, you're in no hurry to face the Black Knight.

—Bob Guerra

Beyond Dark Castle
Activision
Distributed by Mediagenic
3885 Bohannon Dr.
Menlo Park, CA 94025
$29.95

Windwalker

Live honorably among the people. Show generosity toward the unfortunate. Never flee from a just battle. Revere your elders, and respect the common people. Live cleanly to achieve enlightenment, as the tree must root in clean soil to grow straight and tall.

These teachings are but a small sampling of knowledge from a new interactive release by Origin called *Windwalker*. A martial arts adventure set somewhere in the Far East, the game challenges a single player to venture forth in pursuit of true enlightenment among the populace of an imperfect world. Unlike other martial arts games, *Windwalker* requires the player to embrace a total philosophy of mind, body, and spirit, of which the art of self-defense is only a part.

Author Greg Malone has written *Windwalker* as an enhanced sequel to his earlier release, *Moebius*. And enhanced it is. Indeed, it could possibly be one of the most complete computer games I've played. *Windwalker* has just the right mix of interactive adventure, high-energy combat, and intellectual stimulation.

Your first encounter, after booting the game, is with the master, Moebius himself. The graphics throughout the game are extremely well drawn, but Moebius appears almost alive as he meditates in transcendental splendor. Within his outstretched hand are animated starlike spirits that spin and twinkle until your presence is felt. His sharp eyes snap open, his hand clamps shut, and the passive nature of his face quickly changes to disdain as he turns to inspect you, the intruder. His harsh features soften as he recognizes and greets a new disciple or welcomes back a returning one.

The object of the game is to depose the warlord, Zhurong, and the evil court alchemist, Shen Jang, who together have wrongfully taken control of the land. By collecting information from the good people of Khantun, an enlightened being like yourself may be able to piece together the knowledge needed to free the imprisoned Emperor Chao Ti and return him to the Nightingale Throne.

In pursuit of this goal, many will oppose you. Ninja assassins, thieves, pirates, and sword-wielding palace guards lurk about, ready to do away with you. Survival from attack is not the only test a disciple must overcome. A blind beggar accosts you for money. You must decide if it is a good idea to give away what little funds you have. The teachings in the Mystic Runes of *Windwalker*, a 25-page disciple's handbook, may provide you with the answer, as well as provide insight into other dilemmas. During the play of *Windwalker*, maintaining honor and developing good karma are as important as having a powerful roundhouse kick.

Before beginning the adventure, a wise disciple prepares well. An extensive training section is offered so that a player may become acquainted with the keyboard controls, develop a fighting style, and become familiar with the various villains to be encountered. To complete a training cycle, you must become proficient in both barehanded fighting and with the use of a battle stick, called a *monk's staff*. To assist during the training effort, and later within the game, two modes of combat can be selected. As an opponent appears on the screen, you can choose between Concentration and Intuition mode. The first allows you to pause between each blow so that you may concentrate on the fight without being rushed or overwhelmed. In Intuition mode, the attacker continues to advance on you in realtime. As a final test of your training under his tutelage, Moebius sends you into the world of turmoil to bring forth justice.

One of the most complete games I've played, **Windwalker** *has just the right mix of interactive adventure, high-energy combat, and intellectual stimulation.*

You enter the game as a poor fisherman with no clues about how to begin the quest. By interacting with the many inhabitants of the islands, you can make friends or strike bargains for help. The journey carries the player over fully scrolling terrain to all of the islands of Khantun, where time is marked on the horizon by the position of the moon and the rising or setting of the sun. Moonless nights can be especially dangerous.

Directional movement in the game is accomplished with keyboard rather than joystick input. This was awkward at first, and it took some time for me to get comfortable. Interaction with other characters, however, is as simple as highlighting the correct prompt and pressing RETURN.

Windwalker is not for the impatient or for those who want instant gratification. If unrelenting arcade-style combat is your preference, then search for it elsewhere. *Windwalker* is a terrific new breed of character-building/role-playing adventure software that can offer a grand feeling of fulfillment—for those who will take the time to earn it.

—Steve Hedrick

Windwalker
Origin
110 Wild Basin
Suite 110
Austin, TX 78716
$49.95

Monopoly

Real estate is a tough business. Just ask Donald Trump. But where else can you amass millions by selling and reselling used goods? Now computers have moved in, and the folks at Leisure Genius, a ruthless lot, are rumored to have received consultation from Mr. Trump. (Ivana, too?) They've been challenging all comers—and beating most—to the computer version of a classic: *Monopoly*.

While the game is good, you may want to think twice before giving it to a friend. The frustration encountered by being defeated by a computer can easily strain a relationship and cause someone to turn on a pal.

The computer version that Leisure Genius has created incorporates the key aspects of the original board game. The game pieces, from race car to thimble, are all there, though somewhat statically rendered. Opportunities for buying and selling real estate, mortgaging properties, trading—all the basic playing options—are available from the menu bar. These features, combined with a traditional board displayed from a unique perspective and some great sound effects, make this a fun and challenging game.

The computer controls the bank, making it the ultimate winner when you stop to think about it. In fact, watching the computer act as banker can be quite instructive to those who aren't veteran players. Up to eight players—any or all of them represented by the computer—can play. There is also a short version of the game in which you set a time limit. In this mode, a timer sounds as each minute passes, and the rules are are eased somewhat by requir-

ing only three houses to be on a property before you can buy a hotel.

In *Monopoly,* when a player lands on your property, you have to select the rent option within a certain period of time to collect the money owed you. There is also an auction rule that takes over when you land on a property and don't elect to buy it. The computer auctions the property, augmenting the bids by its own chosen increments. One feature not included, which we missed, is a jackpot for Free Parking.

There's a fast-move option that can be toggled on to speed up play, handy if you're a type-A personality. We found it easiest to use the joystick to move around, although you can use the cursor keys.

A couple of sour notes: It's difficult, or at least inconvenient, to get a look at your properties with the review option; it's awkward to use. Also, when dealing with multiple properties, time is wasted while the cursor moves back to Go each time you change property groups.

On a more positive note, the sound effects are excellent. There are special effects for the Electric Company, Waterworks, and railroads. Music plays when you pass Go, and a siren sounds when you go to jail. The graphics for the dice and the properties are clever and faithful to the original. The game-board perspective is distinctive: A bird's-eye view is what you might expect, but instead, the board is seen as it would appear to a real-life player seated at a table.

Leisure Genius has again successfully translated a popular board game to computer with admirable attention to detail and an eye for enthusiastic play. You can enjoy a regular game among friends or flex your muscles against the titan itself—your computer. Either way, Leisure Genius's *Monopoly* is a good way to go. We wonder if Donald Trump started this way.

—David and Robin Minnick

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G

The Automatic Proofreader

Philip I. Nelson

The Automatic Proofreader helps you type in program listings for the 128 and 64 and prevents nearly every kind of typing mistake.

Type in the *Proofreader exactly* as listed. Because the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unusual commands. After you've finished, save a copy before running it.

Next, type RUN and press RETURN. After the program displays the message "Proofreader Active," you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the *Proofreader* displays a two-letter checksum in the upper left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If not, check for your mistake and correct the line.

The *Proofreader* ignores spaces not enclosed in quotation marks, so you can omit or add spaces between keywords and still see a matching checksum. However, spaces inside quotes are almost always significant, so the program pays attention to them.

The *Proofreader* does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it, moving the cursor back to the line, and pressing RETURN.

If you're using the *Proofreader* on the 128, *do not perform any GRAPHIC commands while the* Proofreader *is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the *Proofreader*—to another memory area, causing the *Proofreader* to crash. The same thing happens if you run any program with a GRAPHIC command while the *Proofreader* is in memory.

Though the *Proofreader* doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (65341 for the 128, 64738 for the 64). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

When using the *Proofreader* with another utility, disable *both* programs before running a BASIC program. While the *Proofreader* seems unaffected by most utilities, there's no way to promise it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The Automatic Proofreader

```
10 VE=PEEK(772)+256*PEEK(773):LO
   =43:HI=44:PRINT "{CLR}{WHT}AU
   TOMATIC PROOFREADER FOR ";
20 IF VE=42364 THEN PRINT"C-64"
30 IF VE=17165 THEN LO=45:HI=46:
   WAIT CLR:PRINT "128"
40 SA=(PEEK(LO)+256*PEEK(HI))+6:
   FOR J=SA TO SA+166:READ B:POK
   E J,B:CH=CH+B:NEXT
50 IF CH<>20570 THEN PRINT "*ERR
   OR* CHECK TYPING IN DATA STAT
   EMENTS":END
60 FOR J=1 TO 5:READ RF,LF,HF:RS
   =SA+RF:HB=INT(RS/256):LB=RS-(
   256*HB)
70 CH=CH+RF+LF+HF:POKE SA+LF,LB:
   POKE SA+HF,HB:NEXT
80 IF CH<>22054 THEN PRINT "*ERR
   OR* RELOAD PROGRAM AND CHECK
   {SPACE}FINAL LINE":END
90 IF VE=17165 THEN POKE SA+14,2
   2:POKE SA+18,23:POKESA+29,224
   :POKESA+139,224
100 POKE SA+149,PEEK(772):POKE S
   A+150,PEEK(773):PRINT "{CLR}P
   ROOFREADER ACTIVE"
110 SYS SA:POKE HI,PEEK(HI)+1:PO
   KE (PEEK(LO)+256*PEEK(HI))-1,
   0:NEW
120 DATA120,169,73,141,4,3,169,3
   ,141,5,3,88,96,165,20,133,167
130 DATA165,21,133,168,169,0,141
   ,0,255,162,31,181,199,157,227
140 DATA3,202,16,248,169,19,32,2
   10,255,169,18,32,210,255,160
150 DATA0,132,180,132,176,136,23
   0,180,200,185,0,2,240,46,201
160 DATA34,208,8,72,165,176,73,2
   55,133,176,104,72,201,32,208
170 DATA7,165,176,208,3,104,208,
   226,104,166,180,24,165,167
180 DATA121,0,2,133,167,165,168,
   105,0,133,168,202,208,239,240
190 DATA202,165,167,69,168,72,41
   ,15,168,185,211,3,32,210,255
200 DATA104,74,74,74,74,168,185,
   211,3,32,210,255,162,31,189
210 DATA227,3,149,199,202,16,248
   ,169,146,32,210,255,76,86,137
220 DATA65,66,67,68,69,70,71,72,
   74,75,77,80,81,82,83,88
230 DATA13,2,7,167,31,32,151,116
   ,117,151,128,129,167,136,137
```

G

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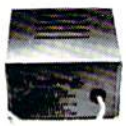

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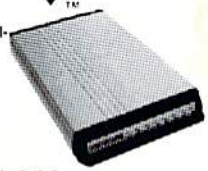

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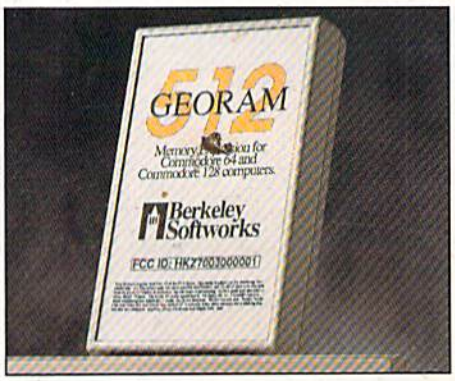

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